Actuarial Note Transmittal — Independent Fiscal Office

House Bill 778, Printer's Number 854
May 9, 2017

The Independent Fiscal Office (IFO) submits an actuarial note for **House Bill 778, Printer's Number 854** in accordance with section 615-B of the Administrative Code of 1929. Per statute, the IFO selected an enrolled actuary (Milliman, Inc.) to prepare the actuarial note, and a copy of the actuary's work product follows page 11 of this transmittal document. In addition, this actuarial note transmittal includes attached cost notes prepared by Conduent and Korn Ferry Hay Group.

House Bill 778, Printer's Number 854 would accelerate the amortization of the unfunded accrued liabilities of the Public School Employees' Retirement System (PSERS) and the State Employees' Retirement System (SERS) by (1) computing the unfunded liabilities using the market value of assets, (2) providing for a fresh start amortization of the unfunded liabilities and (3) providing a schedule of payments that would amortize the unfunded liabilities over approximately 20 years based on a schedule of payments increasing at specified rates. In addition, the bill eliminates the employer contribution collars and requires that the differences between plan experience and actuarial assumptions be funded in level dollar annual contributions over a period of 20 years. The bill does not change the benefit provisions of current or future members.

Table 1 summarizes projections of the proposal's impact on employer contributions for fiscal years (FY) 2017-18 to 2049-50 based on the cost notes prepared by the Systems' actuaries. The table includes the costs/(savings) for cash flow in millions of nominal dollars as well as present values computed at 3.6% and 7.25/7.5% discount rates (7.25% is used for PSERS and 7.5% is used for SERS).

House Bill 778, Printer's Number 854 is projected to save the Commonwealth, on a cash flow basis, $18.2 billion in employer contributions through FY 2049-50, which is equivalent to a savings of $5.1 billion at a present value (PV) of 3.6%. For the first five years, the bill is projected to increase employer contributions by $2.5 billion on a cash flow basis, or $2.2 billion at a 3.6% PV. For fiscal years ending between 2023 and 2035, employer contributions are projected to increase by $8.3 billion on a cash flow basis, or $5.3 billion at a 3.6% PV. The legislation's savings accumulate after FY 2034-35, with reductions in employer contributions over the last 15 years of the projection period expected to be $28.9 billion on a cash flow basis, or $12.6 billion at a 3.6% PV. The bill does not detail the source of the funds to make the additional employer contributions that would be required.

Table 1: Change in Employer Contributions for Fiscal Years 2017-18 to 2049-50			
FY Ending	**Cash Flow**	**Present Value at 3.6%**	**Present Value at 7.25/7.5%**
2018 - 2022	$2,472	$2,243	$2,046
2023 - 2035	8,272	5,276	3,403
2036 - 2050	(28,942)	(12,581)	(5,541)
Total	**(18,198)**	**(5,062)**	**(91)**

Notes: Amounts in millions and based on Systems' actuarial projections. Present value as of June 30, 2017. Values are expressed as costs/(savings). The present value at 7.25/7.5% represents a discount rate of 7.25% for PSERS and 7.5% for SERS. Those rates are based on the assumed investment rate of return used by PSERS as of June 30, 2016 and SERS as of December 31, 2015. The present value at 3.6% represents a proxy for budget growth.

Bill Summary and Analysis

The Public School Employees' Retirement System (PSERS) and the State Employees' Retirement System (SERS) (Systems) administer governmental, cost-sharing, multiple-employer defined benefit pension plans. The plans provide retirement allowances and other benefits, including disability and death benefits, to public school and state government employees. The Systems provide retirement benefits under the authority of the Public School Employees' Retirement Code and the State Employees' Retirement Code (Codes).

The reported unfunded accrued liabilities for PSERS totaled $42.7 billion using the actuarial value of assets from the June 30, 2016 actuarial valuation. The unfunded accrued liability would be $50.0 billion if the market value of assets from that valuation is substituted for the actuarial value. The reported unfunded accrued liabilities for SERS totaled $19.5 billion using the actuarial value of assets from the December 31, 2015 actuarial valuation. The unfunded accrued liability would be $20.3 billion if the market value of assets from that valuation is substituted for the actuarial value.

The appendix and glossary at the end of this transmittal document include additional material regarding employer contributions, the unfunded accrued liabilities of the Systems and the funding of the Systems. This material provides context for the concepts addressed in the following sections that summarize the bill and discuss the actuarial cost impact. Some readers may prefer to review the appendix before reading the next two sections.

Proposal: Accelerated Amortization Schedule

House Bill 778 amends the Codes to accelerate the amortization of the unfunded accrued liabilities of the Systems beginning July 1, 2017. The bill pertains only to the funding requirements of the Systems and does not change the benefit provisions for current or future members. The bill does not detail the source of the additional funding necessary to pay the additional employer contributions resulting from an accelerated amortization schedule.

The unfunded accrued liability of each System would be defined as the balance of the System's recognized accrued liability net of its market value of assets as of the 2016 valuations (June 30 for PSERS

Table 2: Proposed Treatment of Changes to Liabilities and Assets			
	Current Law		Proposal
	Method/Period		Method/Period
	PSERS	SERS	PSERS & SERS
Changes in Liabilities			
Experience Adjustments	LPP/24 Years	LD/30 Years	LD/20 Years
Supplemental Annuities	LPP/10 Years	LD/10 Years	LD/20 Years
Legislation	LPP/10 Years	LD/10 Years	LD/20 Years
Changes in Assets			
Smoothing of Investment Gains and Losses	Actuarial Value of Assets/10 Years	Actuarial Value of Assets/5 Years	Market Value of Assets/n.a.
Notes: LPP is Level Percentage of Pay. LD is Level Dollar. Changes in liabilities represent amortization method/period. See the appendix for additional information on these amortization methods.			

and December 31 for SERS). Current law bases the unfunded accrued liability of each System on the actuarial value of assets, which smooths investment gains and losses by recognizing them over a 10-year (PSERS) or 5-year (SERS) period.

The proposal provides for a re-amortization (fresh start) that eliminates all prior amortizations. The first annual payment under the fresh start would equal 7.4% (PSERS) and 8.15% (SERS) of the respective unfunded accrued liability amount, with each subsequent payment increasing by 3.5% (PSERS) or 2.5% (SERS). In the event that the unfunded accrued liability is less than the previous annual payment, the final payment would equal the remaining unfunded accrued liability amount plus 7.25% (PSERS) or 7.5% (SERS) of that amount. This schedule would amortize the unfunded liability over a period of approximately 20 years based on the investment return assumptions of the Systems. Under current law, the unfunded actuarial accrued liabilities of the Systems were re-amortized over a 24-year period, beginning July 1, 2011 using level percentage of pay amortization payments (PSERS) and over a 30-year period, beginning July 1, 2010 using level dollar amortization payments (SERS).

If the unfunded accrued liability changes due to (1) experience differing from actuarial assumptions, (2) differences between employer contributions and actuarially recommended contributions, and (3) active members making shared-risk contributions, the increase or decrease would be funded in level dollar annual contributions over a period of 20 years, beginning with the actuarial valuation that occurs after June 30, 2016 (PSERS) or December 31, 2016 (SERS). Under current law, the increase or decrease in the unfunded accrued liability due to such factors is funded as a level percentage of pay over a period of 24 years (PSERS) or in level dollar installments over a period of 30 years (SERS). See Table 2 for a summary of these changes.

If the accrued liability changes due to legislation enacted after June 30, 2016 (PSERS) or December 31, 2016 (SERS), including legislation that increases supplemental annuities, the change would be funded in level dollar annual contributions over a period of 20 years. Under current law, such additional liability is funded as a level percentage of pay (PSERS) or in level dollar installments (SERS) over a period of 10 years.

In addition, the bill would eliminate the employer contribution collars imposed under Act 120 of 2010, effective for fiscal years beginning after June 30, 2017.

Actuarial Cost Impact

Milliman submitted the attached actuarial note after reviewing House Bill 778, Printer's Number 854 and the actuarial cost estimates provided by Conduent, the consulting actuary for PSERS and Korn Ferry Hay Group, the consulting actuary for SERS (see attachments). The actuarial cost estimates for SERS are based on the December 31, 2015 actuarial valuation, which reflects an investment return assumption of 7.5%. On April 26, 2017, the SERS Board voted to reduce the investment return assumption to 7.25%, beginning with the December 31, 2016 actuarial valuation. The new investment return assumption of 7.25% is not reflected in the attached cost note provided by Korn Ferry Hay Group.

Table 3 displays the expected nominal dollar cash flow costs/(savings) for employer contributions for the fiscal years (FY) 2017-18 through 2049-50 for both Systems under the proposal, as provided by

the System actuaries. The table also shows the present value of the expected cash flow costs/(savings) as of June 30, 2017, assuming end of year payment, at 3.6% (a proxy for budget growth) and 7.25/7.5% (the investment return used in PSERS'/SERS' cost notes). The 3.6% proxy for budget growth is based on the annual average growth in projected General Fund revenue from FY 2017-18 to 2021-22 in the IFO's November 2016 five-year economic and budget outlook. Table 5 provides detail for each fiscal year.

As noted by the IFO's consulting actuary (page 4 of Milliman letter), the proposed 20-year amortization period for the full recognition of investment gains and losses represents a significant reduction in the time period for recognition. Under current law, such gains and losses are fully recognized over a 34-year period (PSERS) and 35-year period (SERS). This reflects two components: (1) the smoothing of gains and losses to determine the unfunded accrued liabilities of the Systems and (2) the amortization of those gains and losses. For PSERS, the 34-year period is divided between a 10-year smoothing period and 24-year amortization period. For SERS, the 35-year period is divided between a 5-year smoothing period and 30-year amortization period.

Under the proposal, the market value of assets would be used to calculate the unfunded accrued liabilities of the Systems instead of the actuarial value of assets. While the actuarial value of assets is affected by the smoothing of investment gains and losses, the market value is not. As a result, the current difference between those two valuations would be recognized immediately. That amount is $7.4 billion for PSERS as of June 30, 2016 and an estimated $1.0 billion for SERS as of December 31, 2016.

In addition, the IFO's consulting actuary (page 11 of Milliman letter) notes that if the market value of assets is used in future actuarial valuations (instead of the actuarial value of assets), investment returns that vary significantly from each System's assumed rate of return could result in larger than anticipated increases (or decreases) to employer contribution requirements in a given year. As the bill repeals the employer contribution collars imposed by Act 120, the potential swings in employer contribution rates could be significant.

Table 3 divides the projected costs/(savings) into three time periods: (1) FY 2017-18 to 2021-22, representing the short-term impact, (2) FY 2022-23 to 2034-35, representing the medium-term impact and (3) FY 2035-36 to 2049-50, representing the long-term impact. The total costs/(savings) shown in Table 3 differ from those in the cost note for SERS. The SERS cost note displays projections through FY 2051-52, and the last two years are excluded from the table to provide costs that are consistent

Table 3: Change in Employer Contributions for Fiscal Years 2017-18 to 2049-50									
	Cash Flow			Present Value at 3.6%			Present Value at 7.25/7.5%		
FY Ending	PSERS	SERS	Total	PSERS	SERS	Total	PSERS	SERS	Total
2018 - 2022	$2,743	$(271)	$2,472	$2,493	$(249)	$2,243	$2,275	$(229)	$2,046
2023 - 2035	3,770	4,502	8,272	2,537	2,739	5,276	1,752	1,652	3,403
2036 - 2050	(20,506)	(8,435)	(28,942)	(9,035)	(3,546)	(12,581)	(4,101)	(1,440)	(5,541)
Total	(13,994)	(4,204)	(18,198)	(4,006)	(1,056)	(5,062)	(74)	(17)	(91)

Notes: Amounts in millions and based on Systems' actuarial projections. Present value as of June 30, 2017. Values expressed as costs/(savings). See page 6 for breakdown by fiscal year. The present value at 7.25/7.5% represents a discount rate of 7.25% for PSERS and 7.5% for SERS.

with the period reported for PSERS. The projections show that the savings over the entire projection period are much more significant on a cash flow basis than when they are measured on a present value basis. This occurs because the bill shifts the timing of employer contributions to pay down the unfunded accrued liabilities, and the savings that occur at the back end of the projection period are valued much lower when measured by current dollars. The bullets below summarize the projections for three time periods.

- For FY 2017-18 to 2021-22, the Systems project a significant increase in employer contributions for PSERS and a slight decrease in employer contributions for SERS. The short-term increase for PSERS is due to the immediate recognition of the $7.4 billion difference between the market value of assets and the actuarial value of assets. For SERS, the short-term decline is due to the lower deferred investment losses ($1 billion) being offset by the replacement of the current level dollar amortization schedule with one that increases approximately in line with payroll. Generally, an increasing amortization schedule results in lower initial payments compared to a level dollar amortization schedule.

- For FY 2022-23 to 2034-35, employer contributions for the Systems are projected to gradually increase due to the accelerated amortization schedule.

- For FY 2035-36 to 2049-50, employer contributions for the Systems are projected to decline significantly. That result is due to the additional employer contributions made between FYs 2017-18 and 2034-35 and the accumulated investment returns on those contributions.

For further detail on the projected costs/(savings) and the impact on employer contribution rates and amounts, see the actuarial note provided by Milliman and graphs beginning on page 15 of that note. The graphs show the estimated employer contribution rates and amounts, funded ratio and unfunded accrued liability of each System over the projection period under current law and the proposal.

Table 4 displays the change in the unfunded accrued liabilities of the Systems under current law and the proposal at the end of the projection period used by the Systems' actuaries. For the proposal, the IFO's consulting actuary (see page 10 of Milliman letter) notes that the unfunded accrued liability of SERS is not expected to reach zero due to the normal cost calculation, which is based on the average new member and not all active members (PSERS' normal cost is based on all active members).

Table 4: Unfunded Accrued Liabilities under Current Law and Proposal at 2048 Valuation								
	Cash Flow			Present Value at 3.6%			Present Value at 7.25/7.5%		
	PSERS	SERS	Total	PSERS	SERS	Total	PSERS	SERS	Total
Current Law	$610	$2,280	$2,890	$190	$710	$900	$61	$210	$270
Proposed Law	0	1,560	1,560	0	486	486	0	143	143
Change	(610)	(720)	(1,330)	(190)	(224)	(414)	(61)	(66)	(127)

Notes: Amounts in millions and based on Systems' actuarial projections. Present value as of June 30, 2017. The present value at 7.25/7.5% represents a discount rate of 7.25% for PSERS and 7.5% for SERS. Current law uses the actuarial value of assets. Proposed law uses the market value of assets. Using the actuarial value of assets instead of the market value of assets for the proposal would result in different unfunded accrued liability amounts for each System.

| Table 5: Change in Employer Contributions for Fiscal Years 2017-18 to 2049-50 ($ millions)									
	Cash Flow			Present Value at 3.6%			Present Value at 7.25/7.5%		
FY End	PSERS	SERS	Total	PSERS	SERS	Total	PSERS	SERS	Total
2018	$748	$(88)	$660	$722	$(85)	$637	$697	$(82)	$616
2019	597	(62)	535	556	(57)	499	519	(53)	465
2020	471	(60)	410	423	(54)	369	382	(49)	333
2021	469	(51)	418	407	(45)	363	355	(38)	316
2022	458	(10)	448	384	(8)	376	323	(7)	316
2023	409	34	442	330	27	358	268	22	290
2024	382	79	461	298	62	360	234	48	282
2025	353	128	480	266	96	362	202	72	273
2026	300	178	478	218	129	348	160	93	253
2027	268	229	497	188	161	349	133	111	244
2028	260	282	542	176	191	367	120	127	248
2029	256	336	592	167	220	387	110	141	252
2030	252	392	644	159	247	406	101	153	254
2031	252	449	701	154	274	427	95	163	258
2032	254	507	762	150	299	448	89	171	261
2033	256	567	824	146	322	468	84	178	262
2034	260	629	889	143	345	487	79	184	263
2035	268	692	959	142	366	508	76	188	264
2036	(1,401)	757	(644)	(715)	386	(329)	(371)	191	(179)
2037	(3,139)	716	(2,423)	(1,548)	353	(1,194)	(774)	169	(606)
2038	(2,927)	(1,837)	(4,763)	(1,393)	(874)	(2,266)	(673)	(402)	(1,075)
2039	(2,595)	(1,840)	(4,436)	(1,192)	(845)	(2,037)	(556)	(375)	(931)
2040	(2,339)	(1,845)	(4,184)	(1,037)	(818)	(1,855)	(468)	(350)	(817)
2041	(2,111)	(1,375)	(3,485)	(903)	(588)	(1,491)	(393)	(242)	(636)
2042	(1,355)	(1,024)	(2,379)	(560)	(423)	(983)	(236)	(168)	(403)
2043	(997)	(603)	(1,600)	(398)	(241)	(638)	(162)	(92)	(254)
2044	(697)	(333)	(1,031)	(268)	(128)	(397)	(105)	(47)	(153)
2045	(686)	(309)	(995)	(255)	(115)	(370)	(97)	(41)	(137)
2046	(647)	(273)	(920)	(232)	(98)	(330)	(85)	(34)	(119)
2047	(528)	(149)	(678)	(183)	(52)	(235)	(65)	(17)	(82)
2048	(454)	(131)	(585)	(152)	(44)	(195)	(52)	(14)	(66)
2049	(378)	(115)	(494)	(122)	(37)	(159)	(40)	(11)	(52)
2050	(250)	(74)	(325)	(78)	(23)	(101)	(25)	(7)	(32)
Total	(13,994)	(4,204)	(18,198)	(4,006)	(1,056)	(5,062)	(74)	(17)	(91)

Appendix

This appendix provides information on the funding of the Public School Employees' Retirement System (PSERS) and the State Employees' Retirement System (SERS) (Systems). It provides additional context for the changes proposed in House Bill 778.

Generally, the overall funding objective of a public employee pension plan is to provide reserves sufficient to fund the benefits of plan members when those benefits become due and to fund, over time, any unfunded liability through installment payments. The Systems are funded through employer contributions, employee contributions and returns on investments. The employer contribution requirements are based on the employer normal cost, plus any contributions necessary to amortize the unfunded liabilities of the Systems over the statutorily-specified amortization time periods. The Boards of the Systems, in consultation with their actuaries, establish the employer contribution rate annually. Figure A1 displays the employer contribution rates from 1980 to 2017.

As the funded ratio (ratio of assets to liabilities) of a pension plan declines below 100%, the plan's assets represent an increasingly smaller portion of the system's accrued liabilities. A pension trust fund in which the value of the actuarial accrued liabilities exceeds the actuarial value of assets is said to have an unfunded actuarial accrued liability. This funding shortfall may occur for many reasons, including benefit enhancements, unfavorable investment returns, changes in major economic or demographic assumptions or underfunding by the employer. Figure A2 displays the unfunded actuarial accrued liabilities for the Systems between 1980 and 2017.

The unfunded liability represents a long-term debt that must be paid off, or amortized, over time through installment payments. The unfunded liability varies in response to plan experience. Favorable plan experience, resulting from an event such as an extended period of investment returns that exceed the pension fund's assumed rate of return, would result in an actuarial gain, causing the unfunded liability to decline and improving the funded condition of the plan. Conversely, a period of unfavorable plan experience would result in an actuarial loss, causing the unfunded liability to grow and ultimately resulting in the need for additional funding to offset those losses.

Figure A1: Employer Contribution Rates
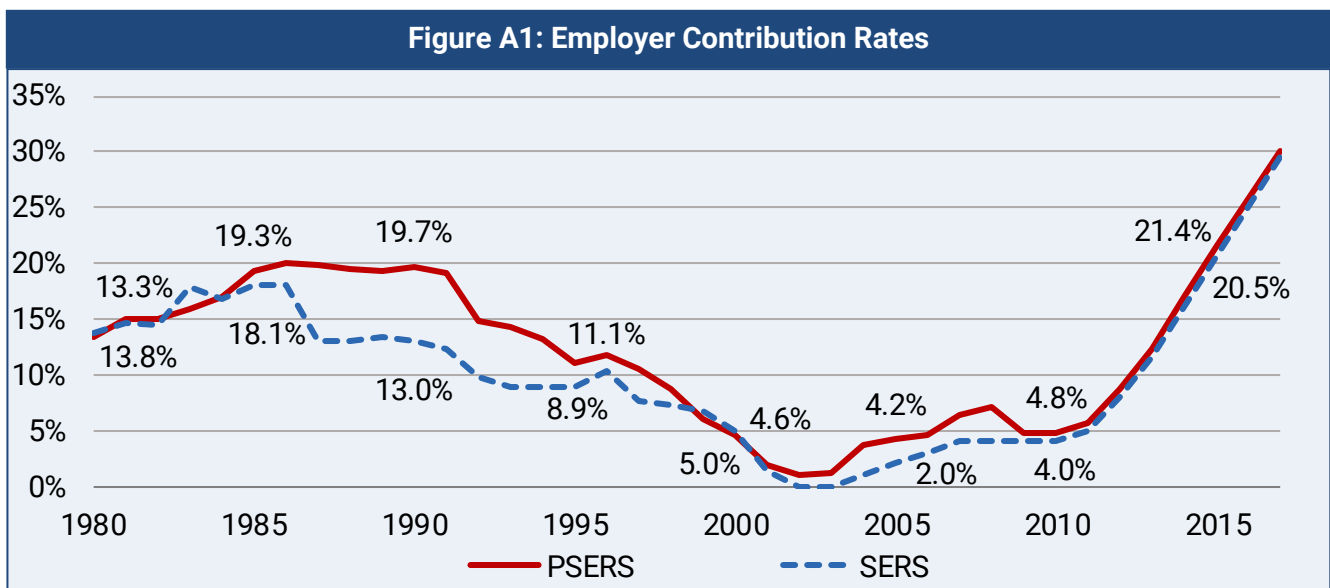
The amount and timing of payments on the unfunded actuarial accrued liability may be influenced by: (1) amortization methods and periods, (2) asset smoothing periods and (3) limits on employer contribution rates (collars). These items are discussed in the following paragraphs.

Amortization Method Unfunded accrued liabilities generally are amortized using (1) level dollar amortization or (2) level percentage of projected payroll amortization. For example, SERS uses the level dollar method over 30 years and PSERS uses the level percentage of projected payroll method over 24 years.

Under level dollar amortization, the amount to be amortized is divided into equal dollar amounts to be paid over a given number of years. Because annual covered payroll of active members can be expected to increase in future years as a result of inflation, level dollar payments generally represent a decreasing percentage of annual payroll. Under level percentage of projected payroll amortization, the percentage remains constant, but payment amounts increase each year at the same rate as the increases in annual covered payroll of active members. The level dollar method will result in higher initial payments compared to the level percentage of payroll method if the amortization periods are the same and payrolls are projected to increase.

Depending on the source of the unfunded liability, the statutes governing PSERS and SERS specify different amortization periods. For example, PSERS and SERS use a 24-year period and 30-year period, respectively, to amortize changes to their unfunded liabilities due to factors such as: experience differing from actuarial assumptions, differences between employer contributions and actuarially recommended contributions, and active members making shared-risk contributions. In contrast, each System uses a 10-year period to amortize changes to their unfunded liabilities due to legislative changes, including ad-hoc supplemental annuities.

Asset Smoothing In public pension systems, asset smoothing involves the gradual recognition of investment gains and losses over time (most commonly, three to five years) rather than immediately and is part of the method used to determine the actuarial value of assets in a pension trust fund. PSERS and SERS currently use a 10-year and 5-year asset smoothing period, respectively.

Figure A2: Unfunded Liability History ($ billions)
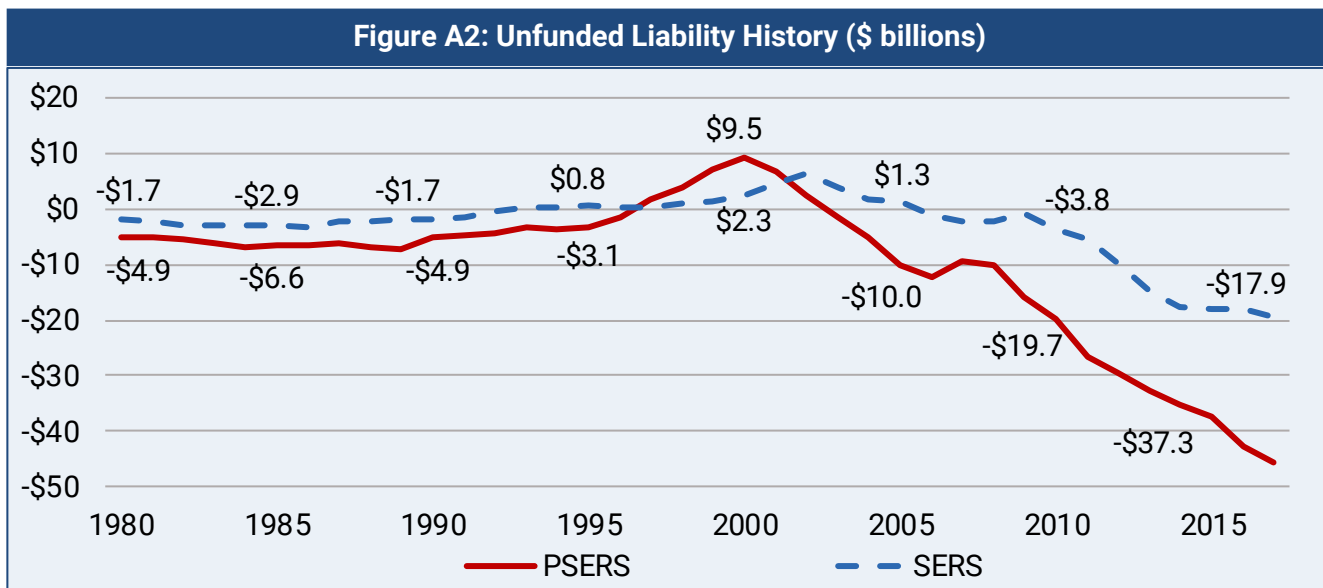
A primary goal of the various smoothing and amortization methods is to avoid large year-to-year fluctuations in employer contributions that may otherwise result from volatility in the investment markets. In the short-term, the smoothing period mitigates the positive and negative effects of major investment gains and losses. However, the delay may cause the actuarial value of assets to deviate significantly from the market value of those assets. See Figure A3.

Collars Limits on the rate at which employer contributions increase from one year to another are referred to as "collars." Act 120 of 2010 imposed collars to manage the increases in employer contributions caused by significant investment losses in the 2008-2009 recession. Currently, the collars apply if the actuarially determined employer contribution rate would increase by more than four and one-half percentage points compared to the prior year. For FY 2017-18 employer contributions, neither PSERS' nor SERS' rates are impacted by the collars.

Figure A4 displays the combined actuarial surpluses and unfunded liabilities of each System from 1995 to 2017. The time period begins with a small net unfunded liability, but by the late 1990s, the unfunded liabilities were eliminated, and the Systems experienced actuarial surpluses. This result was made possible by strong investment returns related to the "dot com" bubble and the corresponding economic expansion. Influenced by strong investment returns and actuarial surpluses, Act 9 of 2001 increased pension benefits for school and state employees through a 25 percent retroactive increase to the benefit accrual rate, while Act 38 of 2002 provided an ad-hoc cost-of-living adjustment to retired school and state employees. Those benefit enhancements significantly increased the Systems' pension obligations. At the same time, the strong investment returns resulted in the Systems' actuaries calculating employer contribution rates that were at or near zero for multiple years.

Following the recession and market downturn of 2001, employer contributions increased, but were artificially suppressed by statutory changes to the funding of the Systems. For example, Act 40 of 2003 (1) reset the amortization period for the increased liabilities resulting from Act 9 of 2001, (2) recognized pre-Act 9 gains more quickly by amortizing them over a 10-year period and (3) delayed the

Figure A3: Asset Value Comparison ($ billions)
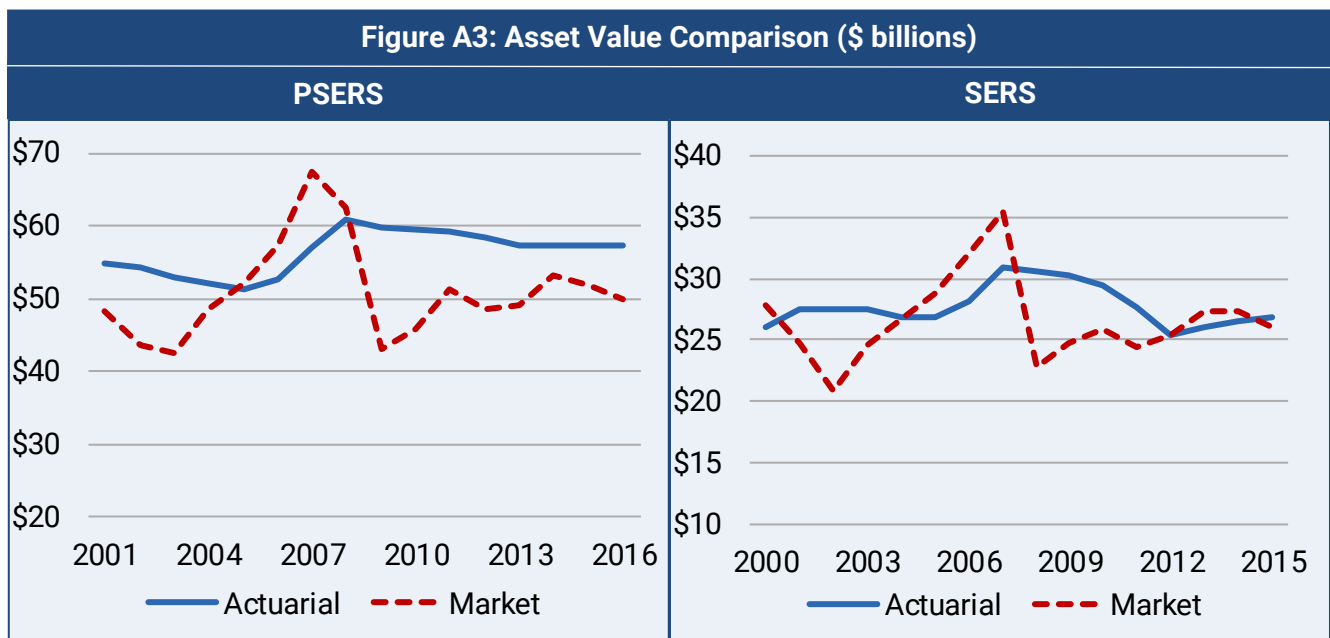
recognition of post-Act 9 losses by amortizing them over a 30-year period. These changes contributed to the unfunded liabilities by effectively reducing employer contribution rates for 10 years. However, strong investment returns for several years in the middle of the decade helped to stabilize the unfunded liabilities.

The 2008 recession and market downturn resulted in sizable investment losses for the Systems, and the unfunded liabilities grew dramatically. Act 120 of 2010 implemented changes to respond to the anticipated increase in employer contributions. For new employees, it retained the higher Act 9 employee contributions while (1) reducing the benefit accrual rate, (2) increasing the vesting period, (3) increasing the normal retirement age and (4) abolishing the lump-sum distribution of accumulated employee pension contributions as a retirement option. Act 120 also re-amortized the unfunded actuarial accrued liabilities of the Systems over a 24-year period, at level percentage of pay (PSERS) and 30-year period at level dollars (SERS) and imposed collars on the employer contribution rate.

Since the enactment of Act 120, both employer contribution rates and the unfunded accrued liabilities of the Systems have continued to increase. The two are interrelated because the vast majority of each employer contribution rate is dedicated to amortizing the unfunded accrued liability. The application of rate collars helped the Commonwealth meet budget constraints, but they held employer contribution rates below the actuarially determined rates for a number of years. This practice increased the unfunded accrued liabilities of the Systems, and ultimately such unfunded liabilities must be amortized and paid through employer contributions and investment returns. Act 120 was designed to eventually pay down the unfunded liabilities and reduce employer contributions, but the deferrals from the collars and the length of the amortization periods imply that those results will not occur for many years.

Figure A4: Unfunded Liability History (PSERS and SERS, $ billions)
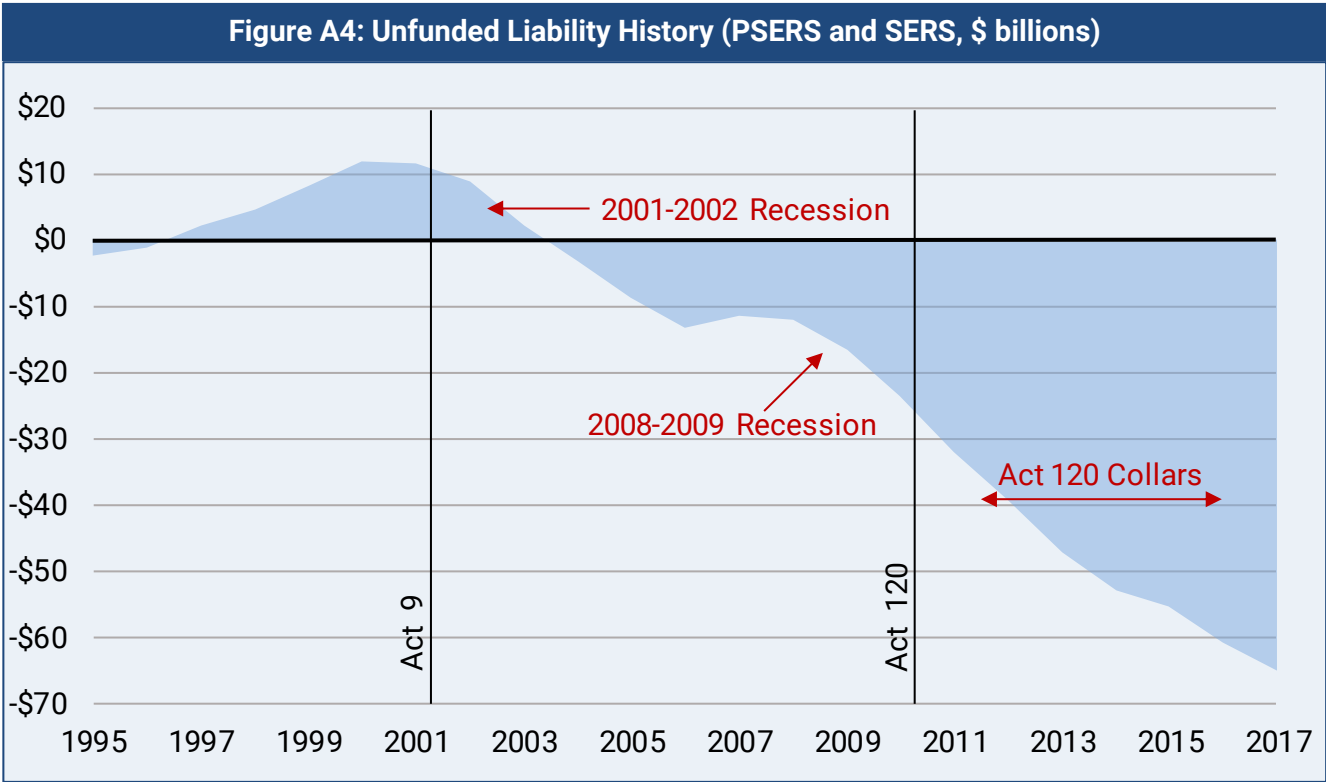
Glossary

Actuarial Accrued Liability

The difference between the present value of future plan benefits and the present value of the future normal cost of those benefits. It is the portion of the present value of future plan benefits attributable to service accrued as of the valuation dates.

Actuarial Value of Assets

The value of the pension plan investments and other property used for the purpose of an actuarial valuation. Actuaries often select an asset valuation method that smooths the effects of short-term volatility in the market value of assets.

Amortization

Paying off an interest-bearing liability through a series of installment payments, as opposed to paying it off in one lump sum payment.

Employee Contribution

The percentage of salary deducted from an employee's paycheck and allocated to the retirement fund.

Employer Contribution

The percentage of payroll the employer contributes to the retirement fund. The employer contribution is equal to the sum of the normal cost and amortization of the unfunded liability.

Market Value of Assets

The value of the pension fund based on the value of the assets as they would trade on an open market, including accrued income and expenses.

Normal Cost

The portion of the total present value of benefits that actuaries allocate to each year of service, both past and future. It is the annual premium that the employer must contribute to fund the benefit. If it is paid for each year of service (and all actuarial assumptions are met), then the employee's pension benefit would be fully funded at the time of retirement.

Unfunded Actuarial Liability

The excess of the actuarial accrued liability over the actuarial value of assets. It is the present value of benefits earned to date that are not covered by current plan assets.

![Milliman]

1550 Liberty Ridge Drive
Suite 200
Wayne, PA 19087-5572
USA

Tel **+1 610 687.5644**
Fax **+1 610.687.4236**

www.milliman.com

May 1, 2017

Mr. Matthew Knittel
Director
Pennsylvania Independent Fiscal Office
Second Floor
Rachel Carson State Office Building
400 Market Street
Harrisburg, PA 17105

Re: House Bill 778, Printer's Number 854

Dear Mr. Knittel:

As you requested, we have prepared an actuarial note on House Bill 778, Printer's Number 854. The Bill would amend both the Public School Employees' Retirement Code and the State Employees' Retirement Code to change the funding of the Public School Employees' Retirement System (PSERS) and the State Employees' Retirement System (SERS). No changes would be made to the benefits provided to PSERS and SERS members. Comments and discussion on the Bill and the projections completed by the System actuaries are included throughout this actuarial note, which contains the following sections.

- Executive Summary (on page 2)
- Summary of the Bill (starting on page 2)
- Discussion of the Bill (starting on page 3)
- Review of Estimated Actuarial Cost Prepared by System Actuaries (starting on page 6)
- Potential Volatility in Employer Contribution Rate due to Investment Returns (starting on page 11)
- Additional Funding Recommendation (on page 12)
- Basis for Analysis (starting on page 13)

In addition, eight graphs illustrate the estimated impact of the Bill on the employer contribution rate, employer contribution amount, funded status, and unfunded accrued liability start on page 15.

Our comments and discussion are summarized in the following Executive Summary.

This analysis was prepared solely for the Pennsylvania Independent Fiscal Office and may not be appropriate for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

Executive Summary

As directed by the IFO, this actuarial note reflects the SERS cost estimate that was prepared based on the December 31, 2015 valuation, which reflected an investment return assumption of 7.5%. On April 26, 2017, the SERS Board voted to reduce the investment return assumption to 7.25% in conjunction with the December 31, 2016 valuation. Prior to enactment of this Bill, we strongly recommend that an updated cost estimate be prepared for SERS reflecting the new investment return assumption and the results of the December 31, 2016 valuation. The Bill's sponsors should also review the determination of the first annual payment of the SERS fresh start amortization.

This actuarial note on House Bill 778, Printer's Number 854, contains several items that we believe are important to the reader. These items are summarized below and are expanded in further detail throughout this actuarial note.

- The PSERS cost analysis performed by Conduent added one year of interest to the initial annual payment of the fresh start amortization. We are uncertain if that was the intent of the Bill's sponsors. (See page 6 for discussion.)
- Prior to enactment, we recommend that the Bill be revised to (1) use the current annual interest rate to increase the final payment of the fresh start amortization instead of the fixed rates currently in the Bill and (2) to clarify the experience adjustment factor for PSERS. (See page 4 for discussion.)
- We support the reduction in the amortization period to 20 years. (See page 5 for discussion.)
- The use of the Market Value of Assets as the Actuarial Value of Assets is likely to cause volatile increases and decreases in the employer contribution rate as experience develops. The impact on contributions of the potential volatility in investment returns is not reflected in the analyses provided by the System actuaries; however, we have provided a simplified analysis of the impact from a sampling of actual returns experienced during the past 10 years from each system. (See page 11 for discussion.)

Summary of the Bill

House Bill 778, Printer's Number 854, would amend both the Public School Employees' Retirement Code and the State Employees' Retirement Code to change the funding requirements effective with the fiscal year beginning July 1, 2017 of the Public School Employees' Retirement System (PSERS) and the State Employees' Retirement System (SERS).

Effective with the actuarial valuation as of June 30, 2016 for PSERS and as of December 31, 2016 for SERS, the unfunded accrued liability (UAL) would be redefined as the

difference between the accrued liability and the market value of assets. This UAL would be amortized as a "fresh start" with prior amortizations eliminated. The first annual amortization payment for the fiscal year beginning July 1, 2017 would equal 7.4% and 8.15% of the UAL in the 2016 valuation for PSERS and SERS, respectively. Each subsequent annual payment shall be equal to the previous annual payment plus 3.5% and 2.5% of the previous annual payment for PSERS and SERS, respectively. When the remaining balance is less than the previous annual payment, the final payment shall be equal to the remaining balance plus an amount equal to 7.25% and 7.5% of the balance for PSERS and SERS, respectively.

In addition, the Act 120 pension contribution collars would be eliminated effective with the fiscal year beginning July 1, 2017 and all later fiscal years.

Future changes in the UAL due to legislation, increases for supplemental annuities, or experience changes would be amortized in level dollar payments over a 20 year period.

In addition, the Actuarial Value of Assets would be set to the Market Value of Assets in all future valuations.

Discussion of the Bill

Currently, funding for PSERS reflects an Actuarial Value of Assets which recognizes investment gains or (losses) over a 10 year period and a 24-year level percent of pay amortization for changes in the UAL (except increases in the accrued liability due to legislation and increases for supplemental annuities are to be amortized over 10 years as level percent of pay). Funding for SERS reflects an Actuarial Value of Assets which recognizes investment gains or (losses) over a 5 year period and 30-year level dollar amortization for changes in the UAL (except changes in the accrued liability due to legislation and increases for supplemental annuities are to be amortized over 10 years with level payments). The UAL was last subject to a fresh start amortization with the enactment of Act 120.

The Bill would require a fresh start amortization of the UAL using the Market Value of Assets, instead of the Actuarial Value of Assets, as determined in the 2016 valuation. This UAL would be amortized using an initial fixed annual payment of 7.4% and 8.15% of this UAL for PSERS and SERS, respectively, with future payments increasing 3.5% and 2.5% each year for PSERS and SERS respectively. Given the current investment return assumption, this amortization schedule is approximately 20 years with payments increasing at the specified rates. All future changes in the UAL would be amortized over a 20-year period in equal dollar amounts. The reduction in amortization period and the change from level percent of pay amortization for future experience gains and losses for

PSERS would accelerate employer contributions to the System.

The Bill resets the Actuarial Value of Assets to the Market Value of Assets with the 2016 valuations. Therefore, all prior deferred investment gains and/or losses are immediately recognized. For PSERS, the Actuarial Value of Assets exceeded the Market Value of Assets by $7.4 billion as of June 30, 2016. For SERS, the estimated Actuarial Value of Assets exceeds the estimated Market Value of Assets by $1.0 billion as of December 31, 2016. If the Bill is enacted, $7.4 billion and $1.0 billion in combined deferred investment losses would be recognized immediately for PSERS and SERS, respectively.

Currently an investment gain or loss for a year is not fully accounted for until 34 years has elapsed from the date established for PSERS (10 years in the Actuarial Value of Assets and then 24 years in amortization payments) and 35 years has elapsed from date established for SERS (5 years in the Actuarial Value of Assets and then 30 years in amortization payments). As the Actuarial Value of Assets would equal the Market Value of Assets in future valuations if the Bill is enacted, this Bill would accelerate the full recognition of future investment gains or losses as the period over which an investment gain or loss is fully recognized is reduced by more than 40% to 20 years (0 years in the Actuarial Value of Assets and then 20 years in amortization payments).

As the System actuaries would be using the System's investment return assumption to determine the remaining balance of the fresh start amortization in each future year, we recommend that §8328(c)(4)(ii) and §5508(c)(3)(ii) be revised prior to enactment to replace "plus an amount equal to 7.25%/7.5% of the balance" with wording such as "increased for one year with the annual interest rate used in determining the normal contribution rate for the year of such final payment". As the Systems may change the investment return assumption from the current 7.25% for PSERS and 7.5% for SERS, using the investment return assumption applicable at that time would avoid an unintentional actuarial gain or loss in the year following the final payment in the event the investment return assumption is not 7.25% or 7.5%. In fact, SERS just adopted an investment return assumption of 7.25% effective with the December 31, 2016 valuation at its April 2017 Board meeting.

§8328(e)(1) regarding the experience adjustment factor for PSERS combines the determination for years before and after the 2016 valuation. Given the fresh start in conjunction with the 2016 valuation, we recommend that this section be split into two parts similar to §5508(f)(1) for SERS prior to enactment.

Amortization periods

In October 2014, the Conference of Consulting Actuaries Public Plans Community released a white paper titled *Actuarial Funding Policies and Practices for Public Pension Plans* ("CCA White Paper"), which is available at https://www.ccactuaries.org/Portals/0/pdf/CCA_PPC_White_Paper_on_Public_Pension_Funding_Policy.pdf. This white paper provides "guidance to policymakers and other interested parties on the development of actuarially based funding policies for public pension plans", which could be helpful to the legislature.

Except for changes due to legislation and increases due to supplemental annuities, this Bill would reduce the amortization periods currently used for funding PSERS and SERS. The reduction in amortization period would help to improve benefit security, protection from adverse experience, and intergenerational equity. The Bill's 20 year amortization period for the fresh start base, experience gains and losses and changes in assumptions falls within the CCA White Paper's model practice.

Under the current funding methodology for PSERS, the implications of using a 24-year level percent of pay amortization is that it takes 13 years before one dollar of principal is paid based on the current assumptions. In other words, for the first 13 years of the amortization, the unfunded liability is expected to increase, e.g. negative amortization occurs. Therefore, contributions are deferred to future years, e.g. back-loaded, under the current methodology. Under the Bill, negative amortization would not occur as (1) the initial fresh start amortization amount is more than one-year's interest on the unfunded liability and (2) a level dollar approach would be used for future amortizations.

However, the amortization period for changes due to legislation and increases due to supplemental annuities would be increased from ten years to twenty years under the Bill. The CCA White Paper recommends that plan amendments impacting active member benefits be amortized over the lesser of the average expected working lifetime of the active member population subject to the amendment and 15 years. The recommendation for plan amendments impacting inactive member benefits (such as increases due to supplemental annuities) is the lesser of the average payment period of the expected increased benefits and 10 years. We recommend that the amortization period for increases due to supplemental annuities be no more than the current ten years. As the recommended amortization period due to changes in legislation would depend on the nature of the change, we recommend that the current 10 year period remain, subject to change in the bill when the legislative change is made.

Review of Estimated Actuarial Cost Prepared by System Actuaries

The IFO provided us with a copy of the April 14, 2017 estimate by Conduent for PSERS and the April 13, 2017 estimate by Korn Ferry Hay Group (Hay) for SERS with the projected impact of this Bill. In addition, Conduent and Hay have provided us with additional details regarding their projections. We appreciate their cooperation in providing this information on a timely basis.

The cost estimates include multi-year projections of the employer contribution rate under the current law and if this Bill was enacted. These estimates show the projected appropriation payroll and the employer contribution rate, and the employer contribution amount. These projections are based on the latest actuarial valuations (June 30, 2016 for PSERS and December 31, 2015 for SERS), and assume that future experience will exactly match the actuarial assumptions used to prepare the valuation and projections.

The multi-year projections reflect a single deterministic scenario assuming that all assumptions are exactly realized, including actual investment return on the market value of assets of 7.25% for PSERS and 7.5% for SERS each and every year. In reality, actual investment returns will vary from year to year, which will have an impact on the future employer and member costs. We strongly recommend that stochastic modeling be performed to analyze the impact of varying investment returns on the future employer costs, especially given that the Actuarial Value of Assets would be equal to the Market Value of Assets in each future valuation subjecting the contribution requirements to increased volatility under the Bill.

Additional commentary

The following represents Milliman's additional commentary on Conduent's analysis for the Bill's impact on PSERS:
- Conduent increased the annual payment of the fresh start UAL amortization by one year of interest to reflect end of year payment. In other words, the first annual payment was determined as (1) 7.4% of the UAL using the Market Value of Assets and (2) multiplying that result by 1.0725. As the Bill did not specify whether an interest adjustment should be applied, this determination should be verified with the Bill's sponsors prior to enactment. We note that this results in a higher employer contribution rate.
- In the determination of the fresh start amortization base, Conduent did not account for the expected UAL amortization contribution that will be made to PSERS during the 2016-2017 fiscal year; whereas Hay reflected it as a receivable contribution. Consideration should be given to reflecting this expected contribution in the fresh start amortization base if this Bill is enacted.

This analysis was prepared solely for the Pennsylvania Independent Fiscal Office and may not be appropriate for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

The following represents Milliman's additional commentary on Hay's analysis of the Bill's impact on SERS:

- Hay's cost estimate is based on the results of the December 31, 2015 valuation. On April 26, 2017, the SERS Board voted to reduce the investment return assumption to 7.25% in conjunction with the December 31, 2016 valuation. Prior to enactment of this Bill, we strongly recommend that an updated cost estimate be prepared for SERS reflecting the new investment return assumption and the results of the December 31, 2016 valuation. The Bill's sponsors should also review the determination of the first annual payment of the SERS fresh start amortization.

- In Hay's 2015 experience study, the mortality assumption was updated to reflect a 10% margin, otherwise known as a static approach to mortality improvement in future years. As they indicated in the experience study, they preferred this approach rather than applying a generational ("built-in") mortality improvement scale. The use of a static approach would be expected to produce actuarial gains until any margin has dissipated over time. As such, the reduction in the amortization period from 30 years to 20 years would recognize these gains over a shorter period. On the other hand, when the mortality assumption is changed at the next experience study to re-incorporate a 10% margin, this presumed increase in liabilities would also be amortized over 20 years rather than 30 years.

Cost Projection Results

The PSERS and SERS estimates of this Bill included the year-by-year cash flow cost/(savings) and the present value of such cash flow cost/(savings) using the System's investment return assumption of 7.25% for PSERS and 7.5% for SERS over the projection period. The present value reflects the time value of money. The interest rate used to discount any savings would vary based on the user's perspective. The Commonwealth may want to use an inflation rate consistent with budget growth as increases in costs above that rate decrease available dollars for other programs in future years, excluding any new revenue. The actuarial cost notes prepared by the System actuaries use the expected return, which is consistent with the development of the System's costs and liabilities.

If this Bill is enacted, the following table shows the expected accumulated nominal dollar cash flow costs/(savings) on the employer contributions for the fiscal years 2017-2018 through 2049-2050 as provided by the System actuaries. It is important to note that Hay displayed contributions through the 2051-2052 fiscal year for SERS and thus, the numbers shown below will differ from those reported by Hay in order to provide costs that are consistent with the period reported by Conduent for PSERS.

The table also shows the present value of the expected cash flow costs/(savings) as of June 30, 2017, assuming end of year payment, at 3.6% (a proxy for budget growth provided by the IFO) and at the current investment return for the Systems (7.25% for PSERS and 7.5% for SERS). Results have been shown for the first five years and then for the following years to show the short-term impact.

Impact on Employer Contributions if House Bill 778, PN 854 is enacted
for Fiscal Years 2017-2018 through 2049-2050
(Amounts in millions and based on System actuary's projections)

	Cash Flow Costs / (Savings) as determined by System Actuary	Present Value of Cash Flow Costs / (Savings) at 3.6% as of June 30, 2017	Present Value of Cash Flow Costs / (Savings) at 7.25% for PSERS and 7.50% for SERS as of June 30, 2017
PSERS			
FY 2017-2018 to FY 2021-2022	$2,742.9	$2,492.5	$2,275.3
FY 2022-2023 to FY 2049-2050	(16,736.4)	(6,498.2)	(2,349.8)
Total	(13,993.5)	(4,005.7)	(74.5)
SERS			
FY 2017-2018 to FY 2021-2022	(271.2)	(249.5)	(229.1)
FY 2022-2023 to FY 2049-2050	(3,933.2)	(806.5)	212.2
Total	(4,204.4)	(1,056.0)	(16.9)
Both PSERS and SERS			
FY 2017-2018 to FY 2021-2022	2,471.7	2,243.0	2,046.2
FY 2022-2023 to FY 2049-2050	(20,669.6)	(7,304.7)	(2,137.6)
Total	(18,197.9)	(5,061.7)	(91.4)

While the preceding table indicates significant savings over the full projection period on a cash flow basis, the majority of the savings occur in the later years due to the accelerated

funding of the Systems due to the shortened amortization period combined with the full recognition of the current difference between the Actuarial Value of Assets and the Market Value of Assets under the Bill. For PSERS, there is a significant increase in contributions over the next five fiscal years including a 17% increase in the employer contribution for the fiscal year beginning July 1, 2017. For SERS, there is a slight decrease in contributions over the next five fiscal years including a slight decrease in the employer contribution rate for the fiscal year beginning July 1, 2017

The present value of the cash flow costs / (savings) at 7.25% or 7.5%, the Systems' investment return assumption, is relatively small as this Bill would only change the timing and amount of the employer contributions to the System. The amortization payment is designed to pay down the unfunded accrued liability, and any subsequent changes, over the intended period. The Bill shifts the timing of contributions to pay down the unfunded accrued liability but does not change the amount of the unfunded accrued liability as of the effective date. Shifting the timing of contributions is akin to taking a different mortgage out but does not change the cost of the house.

Attached to this letter are eight graphs – the first four for PSERS and the second four for SERS – showing the estimated employer contribution rates, the estimated employer contribution amounts, the estimated funded ratio as of the beginning of the fiscal year for PSERS and as of the middle of the fiscal year for SERS, and the estimated unfunded accrued liability as of the beginning of the fiscal year for PSERS and as of the middle of the fiscal year for SERS (the valuation dates for each respective System) under current law and if the Bill is enacted. These graphs are based on the respective System's actuary projections.

As shown on the first PSERS graph (page 15), the estimated employer contribution rate under the Bill increases initially by about 17% and then gradually increases over time until the unfunded accrued liability is paid down, and the employer contribution rate under current law gradually increases over time until the current unfunded liability is paid down. The short-term increase is due to the immediate recognition of deferred investment losses. The gradual increase thereafter reflects the scheduled 3.5% increase in the fresh start amortization payment if the Bill is enacted.

The second PSERS graph (page 16) shows the estimated employer contribution amounts, which has the same pattern as the employer contribution rate.

The third PSERS graph (page 17) displays the projected funded ratio over the projection period based on the ratio of the actuarial value of assets to the actuarial accrued liability. Due to the immediate recognition of the $7.4 billion combined deferred investment losses, there is an immediate decrease in this funded ratio if the Bill is enacted. Under current

law, these deferred investment losses are expected to result in a reduction in the funded ratio over the next 2 years before beginning to increase. By year 7, the projected funded ratio if the Bill is enacted would be expected to be higher than under current law. Due to the increased employer contributions, the funded ratio reaches 100% earlier if the Bill is enacted.

The fourth PSERS graph (page 18) shows the estimated UAL. Under current law, the estimated UAL grows for the first 8 years and then gradually declines. If the Bill is enacted, the estimated UAL would increase slightly for one year and then decline.

As shown on the first SERS graph (page 19), the estimated employer contribution rate under the Bill is lower than under current law for the first five years, and then is higher than under current law until the unfunded accrued liability is paid down. The eventual increase in the employer contribution rate is due to the difference between the current level dollar amortization and the specified 2.5% increase in the fresh start amortization payment under the Bill. Using a level dollar amortization results in a declining contribution rate as a percent of pay. By incorporating an increasing amortization payment, it results in increasing dollar amounts. The increasing amortization factor of 2.5% is similar to expected payroll growth and produces level contribution rates.

As shown on the second SERS graph (page 20), the estimated employer contribution amounts are slightly lower during the first five years if this Bill is enacted and then are significantly higher than under current law during the latter part of the 20-year fresh start amortization period if the Bill is enacted.

As shown on the third SERS graph (page 21), there is small decrease in the funded ratio (ratio of the actuarial value of assets to the actuarial accrued liability) if the Bill is enacted due to the immediate recognition of the $1.0 billion combined deferred investment losses. Due to the shortened amortization period, the funded ratio almost reaches 100% earlier if the Bill is enacted. The funded ratio approaches but does not reach 100% during the projection period due to the anticipated liability loss that occurs when new members join SERS each fiscal year as a consequence of the normal contribution rate determination. Please see the following discussion on modifying the methodology used to determine the normal contribution rate.

The fourth SERS graph (page 22) shows the estimated UAL. Under current law, the estimated UAL is expected to remain stable for the first 4 years as the difference between the actuarial value and market value of assets is recognized and then gradually declines. If the Bill is enacted, the estimated UAL is expected to decline each year, but is not expected to reach $0 due to the normal contribution rate methodology.

Potential Volatility in Employer Contribution Rate due to Investment Returns

As the Bill would set the Actuarial Value of Assets equal to the Market Value of Assets in each future valuation year, the volatility of investment returns in any given year could lead to larger than anticipated increases (or decreases) in the employer contribution requirements from year to year. To illustrate this potential volatility if this Bill is enacted, we have determined the resulting increase (or decrease) in the employer contribution rate assuming the investment return for the upcoming year is equal to an investment return actually experienced during the past 10 years for each System. Any difference between this assumed experience and the investment return assumption (7.25% for PSERS and 7.5% for SERS in this analysis) would be amortized over 20 years in equal dollar amounts. For PSERS, the Market Value of Assets as of June 30, 2016 of $49.96 billion and the estimated 2018-2019 appropriation payroll of $13.66 billion was used. For SERS, an estimated Market Value of Assets as of December 31, 2016 of $26.78 billion and the estimated 2018-2019 appropriation payroll of $6.64 billion was used. For simplicity, no net cash flows were assumed.

Illustrative Increase (or Decrease) in Employer Contribution Rate
for varying actual investment returns
if House Bill 778, Printer's Number 854 is enacted

PSERS		SERS	
Actual Investment Return [1]	Resulting Increase / (Decrease) in Employer Contribution Rate	Actual Investment Return [2]	Resulting Increase / (Decrease) in Employer Contribution Rate
-26.54%	12.76%	-28.7%	14.31%
-2.82	3.80	0.4	2.81
1.29	2.25	2.7	1.90
3.04	1.59	6.4	0.43
3.43	1.44	6.5	0.40
7.96	-0.27	9.1	-0.63
14.59	-2.77	11.9	-1.74
14.91	-2.89	12.0	-1.78
20.37	-4.95	13.6	-2.41
22.93	-5.92	17.2	-3.84

[1] Past ten years of actual investment returns ending June 30, 2016 as reported in PSERS' management's discussion and analysis in the Financial Section of the Consolidated Annual Financial Reports
[2] Past ten years of actual investment returns ending December 31, 2016 as reported on page 28 in SERS 2017 Supplemental Budget Book

This analysis was prepared solely for the Pennsylvania Independent Fiscal Office and may not be appropriate for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

As illustrated in the preceding table, the potential swings in the employer contribution rate could be significant depending on the future actual investment returns if the Bill is enacted. As shown in the preceding table, the lowest and highest changes in contribution rates are an increase of 12.76% and a reduction of 5.92% for PSERS and an increase of 14.31% and a reduction of 3.84% for SERS. This analysis only considers the impact of a single year of investment return experience. Greater volatility could occur when considering two or more years of experience. We are uncertain if employers could adjust to such potential swings in the employer contribution rate from year to year. For this reason, many plan sponsors use an asset smoothing method (as is currently done for PSERS and SERS) to recognize investment gains and losses over a period of years or other smoothing mechanisms similar to the Act 120 collars to reduce volatility in employer contributions from year to year.

Additional funding recommendation

We recommend that the normal contribution rate calculation for SERS be based on all active members (as it is in PSERS) instead of the "average new member". The SERS' actuary currently bases the normal contribution rate calculation on new members in Class A-3, as the average new general employee member would enter this class. This approach is known as "Ultimate Entry Age Normal" and is a non-recommended practice as stated in the CCA White Paper (see page 16).

Basing the normal contribution rate on all active members is considered a model practice in the CCA White Paper. Furthermore, this method also complies with the GASB 67 requirements. We concur with the CCA White Paper and believe this approach is preferable for determining costs under a tiered system. Furthermore, we support adoption of the traditional entry age normal cost method absent any other changes.

Basing the normal contribution rate on "all active members" aligns the normal cost rate with the average costs being earned by current members during the year. This is the traditional way to calculate the normal cost under the entry age normal cost method. Under this method, the actuary develops a normal cost rate based on current active members and the benefits to which each member is entitled. Thus, the normal cost rate would be based on an average of each member reflecting the various benefit accrual rates, the special membership classes in SERS, and the various member contribution rates, depending on each member's date of hire and class of service.

Basis for Analysis

In performing this analysis, we have relied on the information provided by the IFO, PSERS, SERS, Conduent, and Korn Ferry Hay Group. We have not audited or verified this data and other information. If the data or information is inaccurate or incomplete, the results of this analysis may likewise be inaccurate or incomplete.

We performed a limited review of the projections prepared by Conduent and Korn Ferry Hay Group as provided by the IFO, PSERS, and SERS for reasonableness and consistency and, except as described above, have not found material defects. If there are material defects, it is possible that they would be uncovered by a detailed, systematic review and comparison to search for values that are questionable or for relationships that are materially inconsistent. Such a review was beyond the scope of our assignment.

Future actuarial measurements may differ significantly from the current measurements presented in this analysis due to actual plan experience deviating from the actuarial assumptions, the natural operation of the plan's actuarial cost method, and changes in plan provisions, actuarial assumptions, actuarial methods, and applicable law. An assessment of the potential range and cost effect of such differences is beyond the scope of this analysis.

Milliman's work is prepared solely for the internal business use of the Pennsylvania Independent Fiscal Office. To the extent that Milliman's work is not subject to disclosure under applicable public records laws, Milliman's work may not be provided to third parties without Milliman's prior written consent. Milliman does not intend to benefit or create a legal duty to any third party recipient of its work product. Milliman's consent to release its work product to any third party may be conditioned on the third party signing a Release, subject to the following exceptions:

- The IFO may provide a copy of Milliman's work, in its entirety, to its professional service providers who are subject to a duty of confidentiality and who agree to not use Milliman's work for any purpose other than to provide services to the IFO.
- The IFO may provide a copy of Milliman's work, in its entirety, any applicable regulatory or governmental agency, as required by law.

No third party recipient of Milliman's work product should rely upon Milliman's work product. Such recipients should engage qualified professionals for advice appropriate to their own specific needs.

This analysis was prepared solely for the Pennsylvania Independent Fiscal Office and may not be appropriate for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

The consultants who worked on this assignment are pension actuaries. We have not explored any legal issues with respect to the proposed changes. We are not attorneys and cannot give legal advice on such issues. We suggest that you review this proposal with counsel.
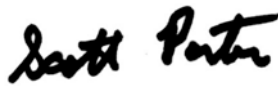
We are members of the American Academy of Actuaries and meet its Qualification Standards to render this actuarial opinion.

Please let us know if we can provide any additional information regarding this Bill.

Sincerely,

Timothy J. Nugent   Scott F. Porter

Katherine A. Warren

TJN:SFP:KAW\78IFO01-78
g:\corr\2017\ifo\ltr05_HB778_20yearfundingchange.docx

Enclosures

PENNSYLVANIA PUBLIC SCHOOL EMPLOYEES RETIREMENT SYSTEM

Estimated Employer Contribution Rates
Under current law and if House Bill 778, Printer's Number 854 is enacted

Based on projections prepared by Conduent as provided by the IFO and PSERS.

This exhibit is an attachment to a May 1, 2017 letter to Mr. Matthew Knittel. Please refer to that letter for more information, including explanatory notes and statements of reliance.

This analysis was prepared solely for the Pennsylvania Independent Fiscal Office and may not be appropriate for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

Milliman

PENNSYLVANIA PUBLIC SCHOOL EMPLOYEES RETIREMENT SYSTEM

Estimated Employer Contribution Amounts
Under current law and if House Bill 778, Printer's Number 854 is enacted

Based on projections prepared by Conduent as provided by the IFO and PSERS.

This exhibit is an attachment to a May 1, 2017 letter to Mr. Matthew Knittel. Please refer to that letter for more information, including explanatory notes and statements of reliance.

This analysis was prepared solely for the Pennsylvania Independent Fiscal Office and may not be appropriate for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

Milliman

PENNSYLVANIA PUBLIC SCHOOL EMPLOYEES RETIREMENT SYSTEM

**Estimated Funded Ratios as of the beginning of the fiscal year
Under current law and if House Bill 778, Printer's Number 854 is enacted**

Based on projections prepared by Conduent as provided by the IFO and PSERS.

This exhibit is an attachment to a May 1, 2017 letter to Mr. Matthew Knittel. Please refer to that letter for more information, including explanatory notes and statements of reliance.

This analysis was prepared solely for the Pennsylvania Independent Fiscal Office and may not be appropriate for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

Milliman

PENNSYLVANIA PUBLIC SCHOOL EMPLOYEES RETIREMENT SYSTEM

**Estimated Unfunded Accrued Liability as of the beginning of the fiscal year
Under current law and if House Bill 778, Printer's Number 854 is enacted**

Based on projections prepared by Conduent as provided by the IFO and PSERS.

This exhibit is an attachment to a May 1, 2017 letter to Mr. Matthew Knittel. Please refer to that letter for more information, including explanatory notes and statements of reliance.

This analysis was prepared solely for the Pennsylvania Independent Fiscal Office and may not be appropriate for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

Milliman

PENNSYLVANIA STATE EMPLOYEES RETIREMENT SYSTEM

**Estimated Employer Contribution Rates
Under current law and if House Bill 778, Printer's Number 854 is enacted**

Based on projections prepared by Korn Ferry Hay Group as provided by the IFO and SERS.

This exhibit is an attachment to a May 1, 2017 letter to Mr. Matthew Knittel. Please refer to that letter for more information, including explanatory notes and statements of reliance.

This analysis was prepared solely for the Pennsylvania Independent Fiscal Office and may not be appropriate for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

Milliman

PENNSYLVANIA STATE EMPLOYEES RETIREMENT SYSTEM

Estimated Employer Contribution Amounts
Under current law and if House Bill 778, Printer's Number 854 is enacted

Based on projections prepared by Korn Ferry Hay Group as provided by the IFO and SERS.

This exhibit is an attachment to a May 1, 2017 letter to Mr. Matthew Knittel. Please refer to that letter for more information, including explanatory notes and statements of reliance.

This analysis was prepared solely for the Pennsylvania Independent Fiscal Office and may not be appropriate for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

Milliman

PENNSYLVANIA STATE EMPLOYEES RETIREMENT SYSTEM

Estimated Funded Ratios as of the middle of the fiscal year
Under current law and if House Bill 778, Printer's Number 854 is enacted

Based on projections prepared by Korn Ferry Hay Group as provided by the IFO and SERS.

This exhibit is an attachment to a May 1, 2017 letter to Mr. Matthew Knittel. Please refer to that letter for more information, including explanatory notes and statements of reliance.

This analysis was prepared solely for the Pennsylvania Independent Fiscal Office and may not be appropriate for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

Milliman

PENNSYLVANIA STATE EMPLOYEES RETIREMENT SYSTEM

**Estimated Unfunded Accrued Liability as of the middle of the fiscal year
Under current law and if House Bill 778, Printer's Number 854 is enacted**

Based on projections prepared by Korn Ferry Hay Group as provided by the IFO and SERS.

This exhibit is an attachment to a May 1, 2017 letter to Mr. Matthew Knittel. Please refer to that letter for more information, including explanatory notes and statements of reliance.

This analysis was prepared solely for the Pennsylvania Independent Fiscal Office and may not be appropriate for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

Milliman

April 14, 2017

Mr. Glen R. Grell
Executive Director
Pennsylvania Public School Employees' Retirement System
5 North 5th Street
Harrisburg, PA 17101

Re: House Bill No. 778 (Printer's No. 854)

Dear Mr. Grell:

As requested, we are writing with regard to House Bill No. 778, which would change the funding requirements for the Pennsylvania Public School Employees' Retirement System (PSERS or System) effective with the June 30, 2016 valuation of the System (fiscal year beginning July 1, 2017). The provisions of House Bill No. 778 are outlined below.

Proposed funding reforms

- Effective with the June 30, 2016 actuarial valuation, the Unfunded Accrued Liability (UAL) would be redefined as the difference between the System's Accrued Liability (AL) and market value of assets (MVA).

- The UAL as of June 30, 2016, would be funded in annual graduated contributions from the fiscal year beginning July 1, 2017, until the balance equals zero. The first annual payment shall be equal to 7.40% of the June 30, 2016 UAL. Each subsequent annual payment shall be equal to the previous annual payment plus an amount equal to 3.5% of the previous annual payment. In the event that the UAL is less than the previous annual payment, the final payment shall be equal to the remaining balance plus an amount equal to 7.25% of the balance.

- Changes in AL due to legislation enacted after June 30, 2016, would be funded in level dollar annual contributions over 20-year periods.

- Increases in AL due to increases in supplemental annuities effective after June 30, 2016, would be funded in level dollar annual contributions over 20-year periods.

- Changes in the UAL after June 30, 2016, due to differences in experience from actuarial assumptions, differences of employer contributions from actuarially recommended levels or active members making shared-risk contributions would be funded in level dollar annual contributions over 20-year periods.

- Effective with the June 30, 2014 valuation of the System, the pension contribution collars imposed by Act 120 would no longer be applicable.

Estimates of the projected financial impact of House Bill No. 778 are presented in the attached tables. These results should be viewed as estimates of the likely pattern of emerging costs resulting from the proposed changes, but should not be viewed as a guarantee of actual costs. Actual future funding obligations will be determined on the basis of the results of actuarial valuations made at future valuation dates, which will likely differ from the estimates provided in these analyses.

Table 1 compares projected employer contribution obligations under the current funding provisions of PSERS with those projected to arise under House Bill No. 778.

The attached Table 2 presents the total projected cost/(savings) of House Bill No. 778 that affect System cost.

Also included are Exhibits, which contain four graphs comparing projected contribution amounts, contribution rates, unfunded accrued liabilities and funded percentages under the current plan provisions to those projected under House Bill No.778.

The estimated cost/(savings) are presented on a cash flow basis. Cost/(savings) shown on a cash flow basis are the sums of the dollar amounts of increases/(reductions) in the projected contributions the employers would have to make in future years if the proposed changes in System provisions are enacted. The calculation of cost/(savings) on this basis makes no distinction between a dollar of projected cost/(savings) in one future year and a dollar of cost/(savings) in some other year in the nearer or more distant future. As noted in the footnote on Table 2, House Bill No. 778 would have a minimal cost impact on a present value basis, as the bill makes no changes to PSERS' benefits and affects only the manner in which they are funded.

The calculations presented here are based on the data, methods and assumptions used in the June 30, 2016 actuarial valuation of PSERS except for the funding changes noted above and the following assumptions for future valuations:

a. The active workforce size is assumed to remain constant over the projection period; and

b. Future new employees are assumed to be Class T-E members and have similar characteristics (age/gender/salary) to new employees who entered the System in the period July 1, 2013, through June 30, 2016.

It should be noted that the June 30, 2016 actuarial valuation for the System has been completed, and the Board has certified the resulting contribution rate of 32.57% for the fiscal year beginning July 1, 2017. Should House Bill No. 778 be enacted, the June 30, 2016 valuation for the System would need to be updated and a contribution rate of 38.13% would need to be recertified by the Board.

The resulting contributions for each fiscal year may differ from actual results that will be determined in future actuarial valuations due to demographic and financial experience different from that assumed. In addition, it is outside the scope of this assignment to determine if the assumptions used in the June 30, 2016 actuarial valuation are reasonable for future valuations. Accordingly, these results should not be used for any purpose other than providing an estimate of future employer pension cost obligations under House Bill No. 778.

Where presented, references to "funded ratio" and "unfunded accrued liability" are measured on an actuarial value of assets basis with respect to the current PSERS funding provisions. Under the funding provisions of House Bill No. 778, "funded ratio" and "unfunded accrued liability" are measured on a market value of assets. It should be noted that the same measurements for the current PSERS funding provisions using market value of assets would result in different funded ratios and unfunded accrued liabilities. Moreover, the funded ratios presented are appropriate for evaluating the need and level of future contributions but make no assessment regarding the funded status of the plan if the plan were to settle (i.e., purchase annuities) for a portion or all of its liabilities.

This analysis only provides information with regards to future funding contributions of the System. It does not provide any information with regards to the impact any changes may have on financial disclosure and expense under applicable GASB standards.

This analysis was prepared under my supervision. I am a Fellow of the Society of Actuaries and a Member of the American Academy of Actuaries. I meet the Academy's qualification Standards to issue this Statement of Actuarial Opinion. This report has been prepared in accordance with all applicable Actuarial Standards of Practice and I am available to answer questions about it.

CONDUENT

Finally, care should be exercised in using this analysis and communicating any results to third parties to ensure that the above caveats and underlying bases of the projections are clearly communicated to any possible recipients.

Please let me know if you have any questions.

Respectfully submitted,

David L. Driscoll, FSA, MAAA, EA, FCA
Principal, Consulting Actuary
Conduent
Enc.
Pc: Brian Carl

R:\TOBIN\2017\April\PSERS04142017DLD – HB778.docx

Table 1
Pennsylvania Public School Employees' Retirement System
Projection of Contribution Rates and Funded Ratios As of June 30, 2016
PSERS (Current) vs. the Hybrid Plan

Fiscal Year Ending June	Appropriation Payroll ($Thousands)	Fiscal Year Market Rate of Return	Pension Rate Floor Current	Pension Rate Floor HB778	Member Contribution Rate Current	Member Contribution Rate HB778	Employer Normal Cost Rate Current	Employer Normal Cost Rate HB778	Employer Unfunded Liability Rate Current	Employer Unfunded Liability Rate HB778	Preliminary Employer Pension Rate Current	Preliminary Employer Pension Rate HB778	Health Care Contribution	Total Employer Contribution Rate Current	Total Employer Contribution Rate HB778	Total Employer Contribution Current	Total Employer Contribution HB778	Cost/(Savings) Cash Flow Basis	Present Value as of June 30, 2017	Funded Ratio Current	Funded Ratio HB778	UAL Current	UAL HB778 (Based on MVA)
2016	13,375,000	1.29	4.00	4.00	7.49	7.49	8.38	8.38	19.44	19.44	27.82	27.82	0.84	25.84	25.84					57.3	49.9	42,723.0	50,157.3
2017	13,549,000	7.25	8.31	8.31	7.52	7.52	8.31	8.31	20.89	20.89	29.20	29.20	0.83	30.03	30.03	4,068,765	4,068,765	0	0	55.6	50.3	45,628.6	51,057.3
2018	13,468,000	7.25	7.70	7.70	7.54	7.54	7.70	7.70	24.04	28.60	31.74	37.30	0.83	32.57	38.13	4,380,339	5,128,104	747,764	697,218	54.6	51.8	47,796.2	50,752.0
2019	13,657,662	7.25	7.52	7.52	7.55	7.55	7.52	7.52	25.80	30.17	33.32	37.69	0.86	34.18	38.55	4,668,189	5,265,029	596,840	518,876	55.5	53.3	47,965.7	50,278.4
2020	13,886,043	7.25	7.36	7.36	7.55	7.55	7.36	7.36	27.32	30.71	34.68	38.07	0.85	35.53	38.92	4,933,711	5,404,448	470,737	381,581	56.4	55.0	48,049.6	49,629.0
2021	14,136,176	7.25	7.21	7.21	7.55	7.55	7.21	7.21	27.89	31.21	35.10	38.42	0.85	35.95	39.27	5,081,955	5,551,276	469,321	354,716	57.0	56.8	48,473.4	48,782.8
2022	14,408,372	7.25	7.06	7.06	7.55	7.55	7.06	7.06	28.51	31.69	35.57	38.75	0.83	36.40	39.58	5,244,647	5,702,834	458,186	322,891	58.0	58.7	48,456.7	47,718.6
2023	14,695,797	7.25	6.92	6.92	7.55	7.55	6.92	6.92	29.36	32.14	36.28	39.06	0.83	37.11	39.89	5,453,610	5,862,153	408,543	268,444	59.2	60.7	48,234.4	46,420.6
2024	14,983,986	7.25	6.79	6.79	7.55	7.55	6.79	6.79	30.07	32.62	36.86	39.41	0.81	37.67	40.22	5,644,468	6,026,559	382,092	234,092	60.2	62.8	48,104.5	44,862.0
2025	15,271,925	7.25	6.64	6.64	7.55	7.55	6.64	6.64	30.80	33.11	37.44	39.75	0.80	38.24	40.55	5,839,984	6,192,766	352,781	201,524	61.5	65.2	47,483.1	43,020.0
2026	15,562,653	7.25	6.50	6.50	7.55	7.55	6.50	6.50	31.68	33.61	38.18	40.11	0.79	38.97	40.90	6,064,766	6,365,125	300,359	159,980	63.4	67.6	46,215.4	40,870.1
2027	15,850,665	7.25	6.35	6.35	7.55	7.55	6.35	6.35	32.45	34.14	38.80	40.49	0.78	39.58	41.27	6,273,693	6,541,569	267,876	133,034	65.4	70.2	44,590.5	38,381.1
2028	16,129,651	7.25	6.20	6.20	7.55	7.55	6.20	6.20	33.10	34.71	39.30	40.91	0.77	40.07	41.68	6,463,151	6,722,839	259,687	120,249	67.6	73.0	42,648.2	35,555.4
2029	16,401,876	7.25	6.05	6.05	7.56	7.56	6.05	6.05	33.76	35.32	39.81	41.37	0.77	40.58	42.14	6,655,881	6,911,751	255,869	110,472	69.9	75.9	40,343.0	32,330.1
2030	16,668,260	7.25	5.88	5.88	7.56	7.56	5.88	5.88	34.46	35.97	40.34	41.85	0.77	41.11	42.62	6,852,322	7,104,012	251,691	101,322	72.5	79.1	37,640.8	28,670.0
2031	16,930,453	7.25	5.73	5.73	7.56	7.56	5.73	5.73	35.17	36.66	40.90	42.39	0.77	41.67	43.16	7,054,920	7,307,184	252,264	94,687	75.3	82.4	34,507.8	24,533.0
2032	17,188,407	7.25	5.56	5.56	7.56	7.56	5.56	5.56	35.90	37.38	41.46	42.94	0.77	42.23	43.71	7,258,664	7,513,053	254,388	89,030	78.3	86.0	30,911.2	19,877.4
2033	17,445,637	7.25	5.40	5.40	7.56	7.56	5.40	5.40	36.65	38.12	42.05	43.52	0.77	42.82	44.29	7,470,222	7,726,673	256,451	83,685	81.5	89.9	26,813.7	14,659.6
2034	17,701,963	7.25	5.23	5.23	7.56	7.56	5.23	5.23	37.41	38.88	42.64	44.11	0.77	43.41	44.88	7,684,422	7,944,641	260,219	79,174	84.9	94.0	22,175.4	8,830.8
2035	17,956,989	7.25	5.05	5.05	7.56	7.56	5.05	5.05	38.19	39.68	43.24	44.73	0.77	44.01	45.50	7,902,871	8,170,430	267,559	75,905	88.7	98.4	16,955.4	2,336.2
2036	18,215,992	7.25	4.88	4.88	7.56	7.56	4.88	4.88	21.34	13.65	26.22	18.53	0.77	26.99	19.30	4,916,496	3,515,686	(1,400,810)	(370,536)	90.6	100.0	14,321.4	69.3
2037	18,478,243	7.25	4.70	4.70	7.56	7.56	4.70	4.70	17.29	0.30	21.99	5.00	0.77	22.76	5.77	4,205,648	1,066,195	(3,139,453)	(774,298)	92.1	100.1	12,183.4	(108.8)
2038	18,749,501	7.25	4.52	4.52	7.56	7.56	4.52	4.52	15.61	(0.10)	20.13	4.42	0.77	20.90	5.29	3,918,646	991,849	(2,926,797)	(673,053)	93.5	100.1	10,154.2	(97.5)
2039	19,027,284	7.25	4.34	4.34	7.56	7.56	4.34	4.34	13.64	(0.10)	17.98	4.24	0.77	18.75	5.11	3,567,616	972,294	(2,595,322)	(556,481)	94.8	100.1	8,305.9	(85.4)
2040	19,316,239	7.25	4.16	4.16	7.56	7.56	4.16	4.16	12.11	(0.10)	16.27	4.06	0.77	17.04	4.93	3,291,487	952,291	(2,339,197)	(467,658)	95.9	100.0	6,577.5	(72.4)
2041	19,616,246	7.25	3.98	3.98	7.56	7.56	3.98	3.98	10.76	(0.09)	14.74	3.89	0.77	15.51	4.75	3,042,480	931,772	(2,110,708)	(393,453)	97.0	100.0	4,950.4	(59.7)
2042	19,929,712	7.25	3.81	3.81	7.56	7.56	3.81	3.81	6.80	(0.08)	10.61	3.73	0.77	11.38	4.58	2,268,001	912,781	(1,355,220)	(235,547)	97.6	100.0	3,958.7	(47.3)
2043	20,264,056	7.25	3.65	3.65	7.55	7.55	3.65	3.65	4.92	(0.07)	8.57	3.58	0.77	9.34	4.42	1,892,663	895,671	(996,992)	(161,570)	98.1	100.0	3,252.8	(35.7)
2044	20,631,884	7.25	3.50	3.50	7.55	7.55	3.50	3.50	3.38	(0.06)	6.88	3.44	0.77	7.65	4.27	1,578,339	880,981	(697,358)	(105,373)	98.4	100.0	2,794.0	(25.2)
2045	20,943,487	7.25	3.36	3.36	7.55	7.55	3.36	3.36	3.26	(0.05)	6.62	3.31	0.77	7.39	4.13	1,555,114	869,096	(686,018)	(96,652)	98.7	100.0	2,313.2	(15.9)
2046	21,503,463	7.25	3.26	3.26	7.54	7.54	3.26	3.26	3.01	(0.04)	6.27	3.22	0.77	7.04	4.03	1,513,844	865,590	(647,254)	(85,026)	98.9	100.0	1,836.5	(8.4)
2047	22,019,999	7.25	3.16	3.16	7.54	7.54	3.16	3.16	2.40	(0.03)	5.56	3.13	0.77	6.33	3.93	1,393,866	865,386	(528,480)	(64,731)	99.2	100.0	1,443.3	(3.0)
2048	22,584,226	7.25	3.10	3.10	7.53	7.53	3.10	3.10	2.01	(0.01)	5.11	3.09	0.77	5.88	3.87	1,327,952	874,010	(453,943)	(51,842)	99.4	100.0	1,094.9	0.0
2049	23,197,178	7.25	3.04	3.04	7.53	7.53	3.04	3.04	1.63	0.00	4.67	3.04	0.77	5.44	3.81	1,261,926	883,812	(378,114)	(40,263)	99.6	100.0	797.5	(0.0)
2050	23,855,576	7.25	3.01	3.01	7.52	7.52	3.01	3.01	1.05	0.00	4.06	3.01	0.77	4.83	3.78	1,152,224	901,741	(250,484)	(24,870)	99.7	100.0	605.5	(0.0)
Total:																$ 151,882,863	$ 137,889,963	$ (13,993,520)	$ (74,477)				

<div align="center">

Table 2

Pennsylvania Public School Employees' Retirement System

</div>

Cost/(Savings) Allocation of Total Potential Projected Cost/(Savings)
Due to the House Bill No. 778 PN854

		Amounts in millions*		
		Cash Flow Basis		Present Value As of June 30, 2017
House Bill No. 778				
Funding Reforms	$	(13,994)	$	(74)
Total Cost/(Savings)	$	(13,994)	$	(74)
Total Amendments Cost/(Savings) as a Percent of the				
Total 34-Year Employer Contributions to be Made Under the				
Current PSERS Plan and Funding Provisions		(9.21%)		

---

*   Estimated cost/(savings) are presented on two bases: a cash flow basis and a present value basis. Cost/(savings) shown on a cash flow basis are the sums of the dollar amounts of (reductions)/increases in the projected contributions the employers would have to make in future years if the proposed changes in System provisions are enacted. The calculation of cost/(savings) on this basis makes no distinction between a dollar of projected cost/(savings) in one future year and a dollar of cost/(savings) in some other year in the nearer or more distant future. The calculation of cost/(savings) on a present value basis, on the other hand, involves discounting projected reductions in contributions from the times they are expected to occur to June 30, 2017, at a rate of 7.25% (the assumed interest rate presently used in the annual actuarial valuations of the System) to reflect the time value of money. It is useful to compare cost/(savings) measured on a present value basis with those measured on a cash flow basis because a dollar of cost/(savings) in future years has a lower value in today's dollars than a dollar that must be paid today.
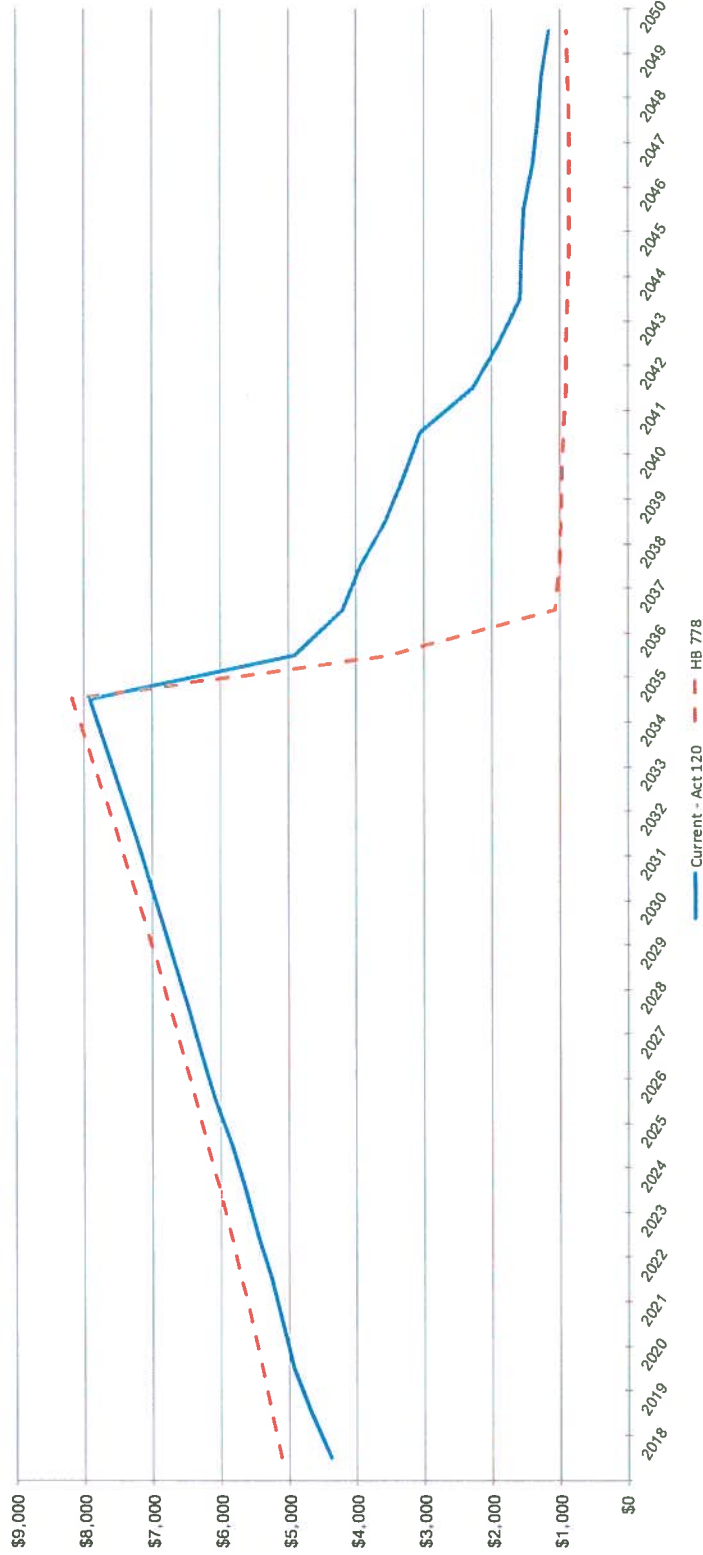
Exhibit I

Pennsylvania Public School Employees' Retirement System

Market Returns Scenario: Actual 2016 Valuation Then 7.25% All Years

HB 778 Plan Funding Reforms
- **Fresh Start UAL at June 30, 2016 based on Market Value of Assets**
- **First Payment of UAL is 7.4% of UAL**   0
- **Each succeeding payment equal to the preceeding year's payment plus 3.5% of the preceeding year's payment**
- **Final payment is equal to remaining balance times 1.0725**

Projection of Employer Contribution Dollars ($ in Millions)
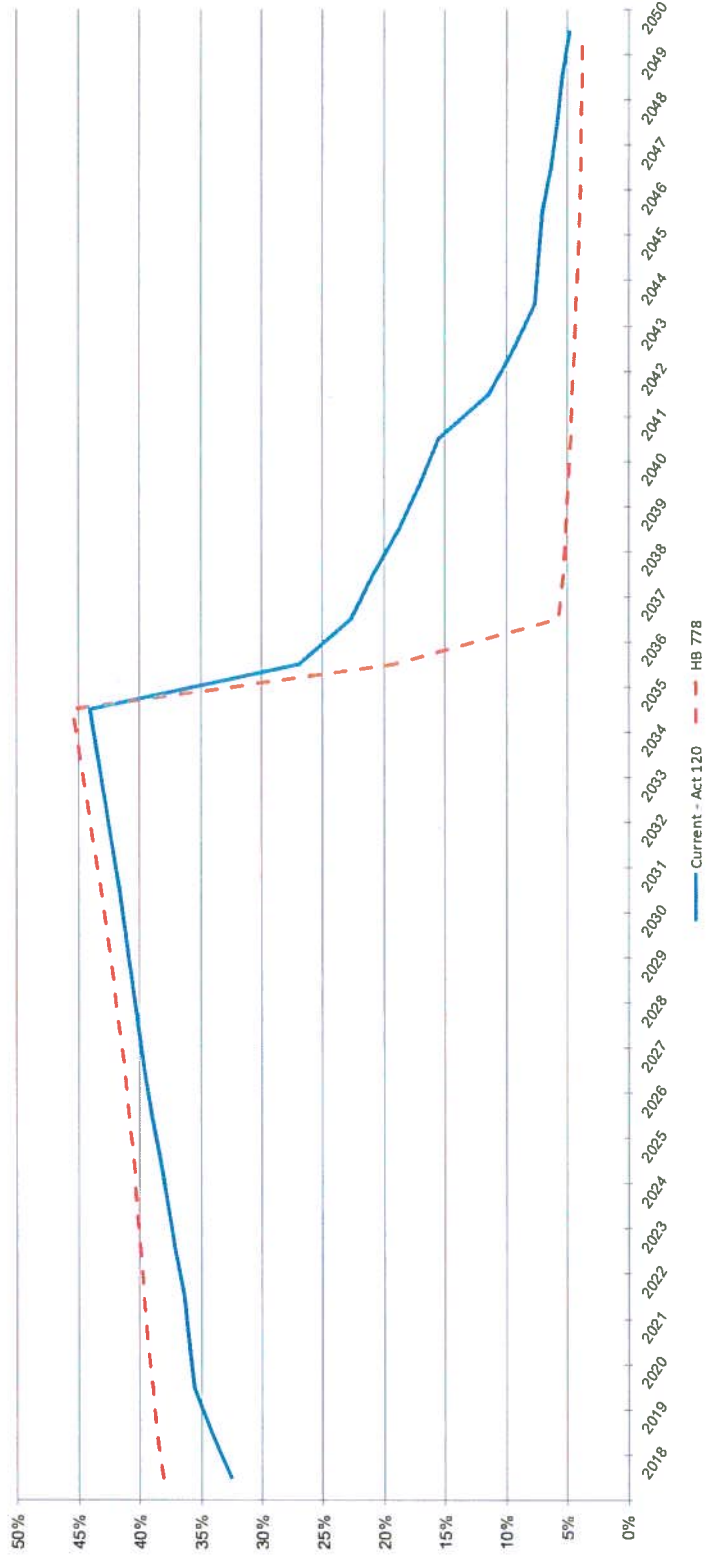
Current - Act 120   HB 778

Exhibit II

Pennsylvania Public School Employees' Retirement System

Market Returns Scenario: Actual 2016 Valuation Then 7.25% All Years

HB 778 Plan Funding Reforms
- **Fresh Start UAL at June 30, 2016 based on Market Value of Assets**
- **First Payment of UAL is 7.4% of UAL**
- **Each succeeding payment equal to the preceeding year's payment plus 3.5% of the preceeding year's payment**
- **Final payment is equal to remaining balance times 1.0725**

Projection of Total Employer Contribution Rate

Legend: Current - Act 120 · HB 778

Exhibit III

Pennsylvania Public School Employees' Retirement System

Market Returns Scenario: Actual 2016 Valuation Then 7.25% All Years

HB 778 Plan Funding Reforms

- Fresh Start UAL at June 30, 2016 based on Market Value of Assets
- First Payment of UAL is 7.4% of UAL
- Each succeeding payment equal to the preceeding year's payment plus 3.5% of the preceeding year's payment
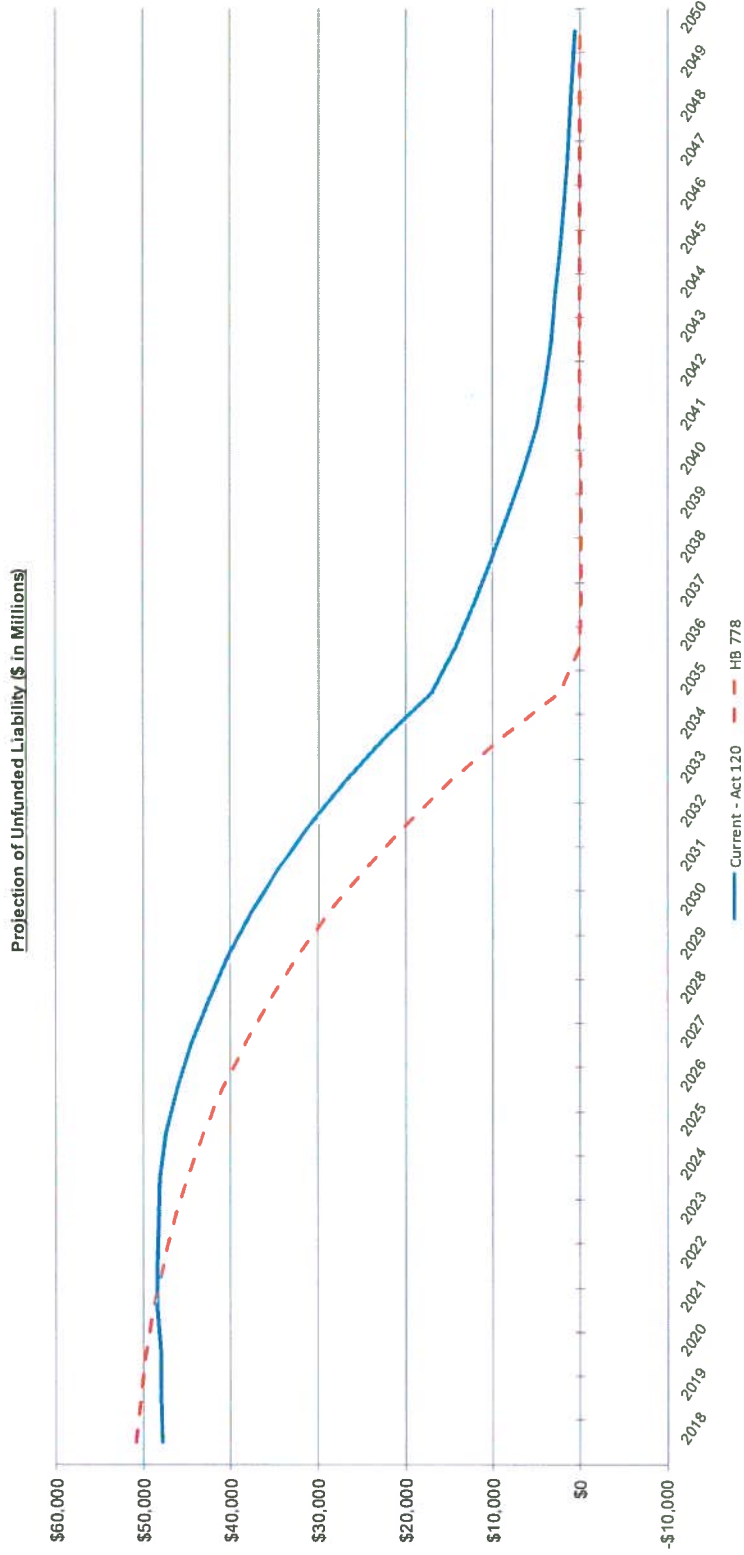- Final payment is equal to remaining balance times 1.0725

Projection of Unfunded Liability ($ in Millions)

Current - Act 120   HB 778

Exhibit IV

Pennsylvania Public School Employees' Retirement System

Market Returns Scenario: Actual 2016 Valuation Then 7.25% All Years
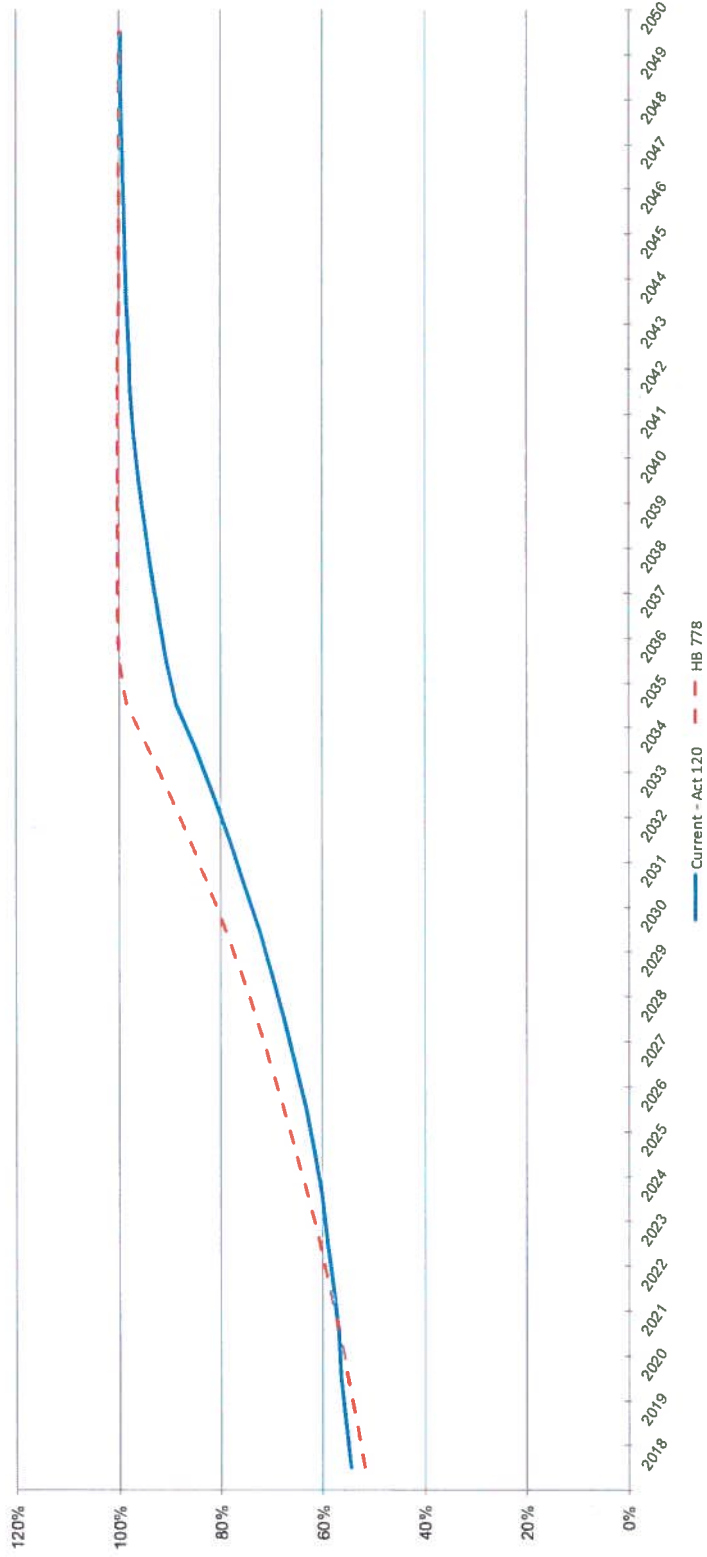
HB 778 Plan Funding Reforms

- Fresh Start UAL at June 30, 2016 based on Market Value of Assets
- First Payment of UAL is 7.4% of UAL
- Each succeeding payment equal to the preceeding year's payment plus 3.5% of the preceeding year's payment
- Final payment is equal to remaining balance times 1.0725

Projection of Sytem Funded Ratio

Current - Act 120   HB 778

Actuarial Cost Note Regarding H.B. 778, P.N. 854

House Bill No. 778 (P.N. 854), (hereafter HB 778), if enacted, would result in changes, effective July 1, 2017, to the financing provisions of both of Pennsylvania's statewide retirement systems. That is, <u>the benefit provisions of both systems would not be changed at all under HB 778, neither for current members nor for future members; HB 778 would strictly change financing provisions.</u> Although HB 778 proposes nearly identical changes to both systems, this note addresses only the changes applicable to the Pennsylvania State Employees' Retirement System (SERS).

<u>Summary</u>

HB 778 proposes financing provision changes effective July 1, 2017, as follows:

- Elimination of all future Act 2010-120 contribution collars, meaning that the last applicable collared contribution would be the 29.5% of payroll contribution applicable for the fiscal year ending June 30, 2017. Because it is expected that the Act 120 contribution collars will be applicable for the last time for the fiscal year ending June 30, 2017 (at an employer contribution rate of 29.5% of payroll), the employer contribution rates for FY2018 and beyond are not expected to be governed by the Act 120 contribution collars. Therefore, this provision is not expected to have any effect.

- Fresh start amortization of the December 31, 2016 unfunded actuarial accrued liability, utilizing annual graduated contributions beginning July 1, 2017 until the balance equals zero, as follows:

  o The fresh start determination of the unfunded actuarial accrued liability will be based upon the market value of System assets. That is, the new unfunded accrued liability as of December 31, 2016 will equal the excess of the total actuarial accrued liability over the market value of assets as of December 31, 2016.
  o The first annual payment (as of July 1, 2017) to amortize the unfunded liability will equal 8.15% of the newly determined December 31, 2016 unfunded actuarial accrued liability.
  o Each subsequent annual payment will equal the previous annual payment plus 2.50% of the previous annual payment.
  o When the remaining balance of the unfunded accrued liability decreases to a level that is less than the previous annual payment, the final payment will equal the remaining balance plus 7.5% of the remaining balance.

- Amortization of all new (after December 31, 2016) unfunded actuarial accrued liabilities (whether due to gains and losses or future legislation) over 20 years using a level dollar amortization method.

- Continuation of the use of market value of assets as the method for determining the actuarial value of System assets for annual actuarial valuations occurring after December 31, 2016. Therefore, the current five-year smoothing method for valuing System assets would no longer apply effective with the December 31, 2016 actuarial valuation.

Projection of Future Costs Under HB 778

Starting with the census data, asset data and actuarial assumptions and methods underlying our most recently completed (as of December 31, 2015) actuarial valuation (including an assumed investment return of 7.5 percent per year, compounded annually) and projecting those results forward, Korn Ferry Hay Group has projected the future (post-6/30/2017) employer contributions required to fund SERS in accordance with HB 778.

Schedules Attached to This Cost Note

We have attached to this note the results of our funding projections, as follows:

- **HB 778 Projection, Assuming Fresh Start of the Unfunded Actuarial Accrued Liability Based Upon the Market Value of Assets as of December 31, 2016,** that is, reflecting the revised SERS financing provisions (all as fully described on the preceding page): This table presents our projection of future SERS funding through fiscal year 2051/2052, all of which reflects the impact of the HB 778 provisions.
- **Baseline Projection:** This table presents, for purposes of comparison, the results of our December 31, 2015 actuarial valuation and our projection of future funding through fiscal year 2051/2052, assuming no changes to any of the current SERS benefit provisions or financing methodologies.

Our Cost Results in Brief (See Important Note #1 Below Regarding These Results.)

Taking all the above-described aspects of HB 778 into account, we have determined (as shown in our attached HB 778 Projection) that House Bill No. 778, if it became law, would result in

i. Immediate moderate decreases in the annual costs to fund SERS (averaging less than 1% of payroll in savings each year), that would continue over the next 5 years, followed by

ii. Increases in the annual costs (moderate initially, trending to significant) over the following 15 years (with the highest increase in annual cost over that period estimated to be about 7% of payroll), followed by

iii. Decreases in the annual costs (significant initially, trending to moderate) for the remaining years in our projection period (which runs through fiscal year 2051/2052).

About 23 years after the HB 778 effective date, we project that the cumulative impact of the legislation would, for the first time, become a significant (greater than $1 billion) savings, and, thereafter, the cumulative savings would continue to increase with each passing year. As shown at the bottom of our attached HB 778 Projection, we project that the cumulative savings through the end of fiscal year 2051/2052 would reach a level of approximately $4.28 billion.

The above-described pattern of costs/(savings) occurs primarily because HB 778 would replace the current (and past) 30-year level dollar unfunded accrued liability amortization schedule with a 20-year increasing dollar schedule. HB 778's initial amortization payment in FY 2017-2018 is less than the current law's amortization payment for 2017-2018. Thereafter, the amortization payments under HB 778 increase (ultimately rising more than 55 percent over the next 20 years, somewhat in line with anticipated future payroll growth), exceeding the current scheduled payments after 5 years, and fully funding the unfunded accrued liability after 20 years. Once the unfunded accrued liability is paid off under HB 778, then large annual savings versus Baseline occur because the current law 30-year amortization schedule would have continued for another 10 years.

The $4.28 billion savings estimate referenced above was determined on the basis of comparing projected future cash flows (HB 778 versus Baseline). If the savings were determined instead by calculating the present value of projected future savings, the present values of the savings would be:

- Present Value assuming a 3.5% annual discount rate: $1.15 billion in savings

- Present Value assuming a 7.5% annual discount rate: $0.02 billion in savings

Important Notes

Please note the following regarding our handling of the attached funding projections:

1. Korn Ferry Hay Group is currently in the process of performing the December 31, 2016 actuarial valuation for SERS; therefore, the most recent valuation results now available are those determined as of December 31, 2015 (and included in our 2015 Actuarial Report dated June 8, 2016). As noted above, the projection results attached to this note (both the HB 778 Projection and the Baseline Projection) were determined by starting with the census data, asset data and actuarial assumptions and methods underlying our December 31, 2015 actuarial valuation (including an assumed investment return of 7.5 percent per year, compounded annually) and projecting those results forward.

   Our December 31, 2016 actuarial valuation will be completed at the end of April. If this proposed legislation is still being considered at (or after) that time, it may be appropriate to:

   - Review the percentages included in HB 778's proposed amendment to Section 5508 (c) (3) of Title 71 and/or

- Request that Korn Ferry Hay Group perform revised projections based upon the newly available valuation results.

2. Korn Ferry Hay Group's past convention of showing results for employer cost projections such as these as percentages of payroll to two decimal places may be somewhat misleading. This level of precision is not really possible for estimates of this nature.

3. All of these projections are based upon the expectation that (i) for all years after 2015, the actual economic and demographic experience of SERS will be consistent with the underlying actuarial valuation assumptions and (ii) all employer contribution amounts shown in the "Expected FY Contribution" columns will, in fact, be contributed.

4. The attached projection schedules include a particularly important column of information that may warrant further explanation: "Cumulative (Savings) / Cost Relative to Baseline" shows the projected cumulative cost or savings in employer contributions (in millions of dollars) that would result under HB 778 versus under the current law (Baseline).
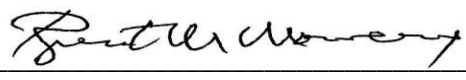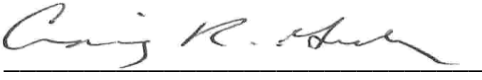
Actuarial Certification

To the best of our knowledge, the information we are presenting herein is complete and accurate and all costs and liabilities have been determined in conformance with generally accepted actuarial principles and on the basis of actuarial assumptions and methods which are reasonable (taking into account the past experience of SERS and reasonable expectations) and which represent our best estimate of anticipated experience under the plan.

The actuaries certifying to this valuation are members of the Society of Actuaries or other professional actuarial organizations, and meet the General Qualification Standards of the American Academy of Actuaries for purposes of issuing Statements of Actuarial Opinion.

Please let us know if you have any questions on any of this.

Respectfully submitted,
Korn Ferry Hay Group, Inc.

By: _____   By: _____
Brent M. Mowery, F.S.A.   Craig R. Graby
Member American Academy of Actuaries   Member American Academy of Actuaries
Enrolled Actuary No. 17-3885   Enrolled Actuary No. 17-7319

April 13, 2017

SERS Projected Employer Contributions
(Based Upon Final December 31, 2015 Valuation)

4/13/2017

December 31, 2015 Data and Assets; Current Entry Age Funding Method; Act 120 Benefit Provisions; 7.50% Liability Interest Rate Assumption; Per HB 778 at 12/31/16: Fresh Start of UAL Based on Market Value of Assets, With New UAL Amortized Using 8.15% of UAL Payment in 1st Yr, Increasing By 2.5% Per Yr Thereafter; For Valuations After 12/31/16, All Liability Amortizations Will Be 20-Yr Level Dollar & Actuarial Value of Assets Equals Market Value of Assets

Year	Investment Return	Fiscal Year	Ceiling Contribution	Floor Contribution	Projected Percent Contribution	Expected FY Payroll ($ in millions)	Expected FY Contribution ($ in millions)	Annual (Savings) / Cost Relative to Baseline	Cumulative (Savings) / Cost Relative to Baseline	Funded Ratio (AV%)	UAL ($ in billions)	Funded Ratio (MV%)
2013	13.60%	2014/2015	NA	5.00%	20.50	5,897.6	1,209.0	-	-	59.2	17.90	62.4
2014	6.40%	2015/2016	NA	4.95%	25.00	6,021.7	1,505.4	-	-	59.4	18.17	61.1
2015	0.40%	2016/2017	NA	4.52%	29.50	6,255.2	1,845.3	-	-	58.0	19.45	56.2
2016	7.50%	2017/2018	NA	4.52%	30.34	6,446.0	1,955.6	(87.7)	(87.7)	56.7	20.42	56.7
2017	7.50%	2018/2019	NA	4.52%	30.28	6,642.6	2,011.5	(61.7)	(149.4)	57.6	20.34	57.6
2018	7.50%	2019/2020	NA	4.52%	30.22	6,845.2	2,068.9	(60.4)	(209.8)	58.6	20.21	58.6
2019	7.50%	2020/2021	NA	4.52%	30.16	7,054.0	2,127.8	(51.4)	(261.2)	59.6	20.03	59.6
2020	7.50%	2021/2022	NA	4.52%	30.10	7,269.1	2,188.3	(10.0)	(271.2)	60.7	19.78	60.7
2021	7.50%	2022/2023	NA	4.52%	30.04	7,490.8	2,250.4	33.5	(237.7)	61.8	19.47	61.8
2022	7.50%	2023/2024	NA	4.52%	29.98	7,719.3	2,314.2	79.4	(158.3)	63.0	19.08	63.0
2023	7.50%	2024/2025	NA	4.52%	29.91	7,954.7	2,379.6	127.6	(30.7)	64.4	18.62	64.4
2024	7.50%	2025/2026	NA	4.52%	29.85	8,197.3	2,446.9	177.7	147.0	65.8	18.06	65.8
2025	7.50%	2026/2027	NA	4.52%	29.78	8,447.3	2,515.9	229.2	376.2	67.3	17.41	67.3
2026	7.50%	2027/2028	NA	4.52%	29.72	8,705.0	2,586.7	282.0	658.2	69.0	16.66	69.0
2027	7.50%	2028/2029	NA	4.52%	29.65	8,970.5	2,659.5	336.3	994.5	70.9	15.79	70.9
2028	7.50%	2029/2030	NA	4.52%	29.58	9,244.1	2,734.2	391.9	1,386.4	72.9	14.80	72.9
2029	7.50%	2030/2031	NA	4.52%	29.51	9,526.0	2,810.9	449.0	1,835.4	75.1	13.67	75.1
2030	7.50%	2031/2032	NA	4.52%	29.44	9,816.6	2,889.6	507.4	2,342.8	77.6	12.40	77.6
2031	7.50%	2032/2033	NA	4.52%	29.36	10,116.0	2,970.5	567.4	2,910.2	80.3	10.98	80.3
2032	7.50%	2033/2034	NA	4.52%	29.29	10,424.5	3,053.5	628.9	3,539.1	83.2	9.38	83.2
2033	7.50%	2034/2035	NA	4.52%	29.22	10,742.5	3,138.8	691.9	4,231.0	86.5	7.59	86.5
2034	7.50%	2035/2036	NA	4.52%	29.14	11,070.1	3,226.3	756.5	4,987.5	90.1	5.60	90.1
2035	7.50%	2036/2037	NA	4.52%	28.14	11,407.8	3,209.9	716.4	5,703.9	94.0	3.39	94.0
2036	7.50%	2037/2038	NA	4.52%	5.80	11,755.7	681.4	(1,836.5)	3,867.4	98.1	1.06	98.1
2037	7.50%	2038/2039	NA	4.52%	5.80	12,114.2	702.6	(1,840.4)	2,027.0	98.1	1.09	98.1
2038	7.50%	2039/2040	NA	4.52%	5.80	12,483.7	724.4	(1,844.6)	182.4	98.1	1.13	98.1
2039	7.50%	2040/2041	NA	4.52%	5.81	12,864.5	746.9	(1,374.5)	(1,192.1)	98.0	1.16	98.0
2040	7.50%	2041/2042	NA	4.52%	5.81	13,256.8	770.1	(1,023.6)	(2,215.7)	97.9	1.20	97.9
2041	7.50%	2042/2043	NA	4.52%	5.81	13,661.2	794.0	(603.3)	(2,819.0)	97.9	1.24	97.9
2042	7.50%	2043/2044	NA	4.52%	5.82	14,077.8	818.7	(333.2)	(3,152.2)	97.8	1.28	97.8
2043	7.50%	2044/2045	NA	4.52%	5.82	14,507.2	844.1	(309.0)	(3,461.2)	97.7	1.33	97.7
2044	7.50%	2045/2046	NA	4.52%	5.82	14,949.7	870.3	(273.2)	(3,734.4)	97.6	1.37	97.6
2045	7.50%	2046/2047	NA	4.52%	5.82	15,405.7	897.4	(149.4)	(3,883.8)	97.5	1.41	97.5
2046	7.50%	2047/2048	NA	4.52%	5.83	15,875.5	925.2	(131.0)	(4,014.8)	97.4	1.46	97.4
2047	7.50%	2048/2049	NA	4.52%	5.83	16,359.7	954.0	(115.4)	(4,130.2)	97.3	1.51	97.3
2048	7.50%	2049/2050	NA	4.52%	5.83	16,858.7	983.6	(74.2)	(4,204.4)	97.2	1.56	97.2
2049	7.50%	2050/2051	NA	4.52%	5.84	17,372.9	1,014.2	(39.6)	(4,244.0)	97.0	1.61	97.0
2050	7.50%	2051/2052	NA	4.52%	5.84	17,902.8	1,045.7	(36.4)	(4,280.4)	96.8	1.66	96.8